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ROCK GARDENS

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PLATE I.—ALPINE MEADOW, MT. WASHINGTON

AMERICAN ROCK GARDENS

BY

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Sketches and Drawings by
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STATEMENT

THERE is still a great need of a simple book on rock gardens. New plants are continually being brought into cultivation from Yunnan or the Rockies, but the processes involved in construction or the methods of maintenance have not changed, though many garden builders have not studied them sufficiently. The effects produced today are not superior to those of a generation ago when this cult was started, while the flower fields of the Alps or the Yellowstone have the same wild and compelling beauty which was theirs before the advent of man.

All that needs be said in directions or inspiration is found in the writings of the two pioneers in this craft, particularly in the formal treatise of each on this subject. Were my library on this topic reduced to two books, I would choose quickly to retain "Alpine Flowers for English Gardens," by William Robinson, printed by John Murray, London, 1870. This is out of print but still purchasable second-hand. It is really more

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important to reprint this book than to write another one. The second is "Les Plantes des Montagnes et des Rochers," by Henri Correvon, printed by Octave Doin & Fils, Paris, 1914. This edition and an English translation, which is now ready, may also be obtained from the author, at Floraire, Chêne-Bourg, Geneva, Switzerland.

If there is any important direction to be made in this kind of gardening, these two enthusiasts have noted it, and all the many new books in England or America count merely for further enthusiasm. But with many readers there is place for many books; so herewith is more enthusiasm offered.

The attempt has been made to present in a new way the complicated process of constructing and operating a rock garden, and to encourage as far as may be an understanding of how the special needs of these plants may be met. Other notes on rock plants have appeared in "Horticulture" and "The House Beautiful" in recent years.

So far as the common names are given in "Standardized Plant Names" these are used in the lists, but for many rock plants the common name was procured from various sources.

STATEMENT

A pressing need is a more available supply of plants for these gardens, and information as to where to get them. In Europe there are dealers ever ready with any alpine for your desire, but here rock plants have been found so far to be a perishable, unsalable commodity, save a few tough weeds which grow anywhere. Seeds unlimited may be imported from Europe or New Zealand, but few are the gardeners who are patient to grow these into plants. It is time that attention was turned to our own mountain flora and more study made of these treasures, that there may be a greater demand for them. In the lists of this book the American species are marked with an asterisk (*).

S. F. H.

**Botanic Garden,
Cambridge, Mass.,
January, 1929.**

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ALL PHOTOGRAPHS were taken by the author from the wild on Mt. Washington, or in the Botanic Garden of Harvard University. The sketches were made on Mt. Washington by W. Walter Bowers, and the diagrams are after those in William Robinson's "Alpine Flowers for English Gardens."

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I CONSIDERATIONS

IN debating whether or not to add a rock planting to our garden equipment, there are many things to be decided. Of course such a garden is popular and has many inducements to offer. But there are definite problems to be faced before the rocks and plants are ordered.

First, there is the expense. Except for formal gardens where heavy grading is undertaken, no kind of garden is so expensive as this in construction or operation. Like many simple effects in other arts, they are not created casually, but at great mental pains and mechanical effort. For a reproduction of nature it seems disproportionately costly, though some are built and maintained with little difficulty. If not constructed with careful planning and proper materials, the rock garden soon goes back to nature (weeds), and the area becomes more unsightly

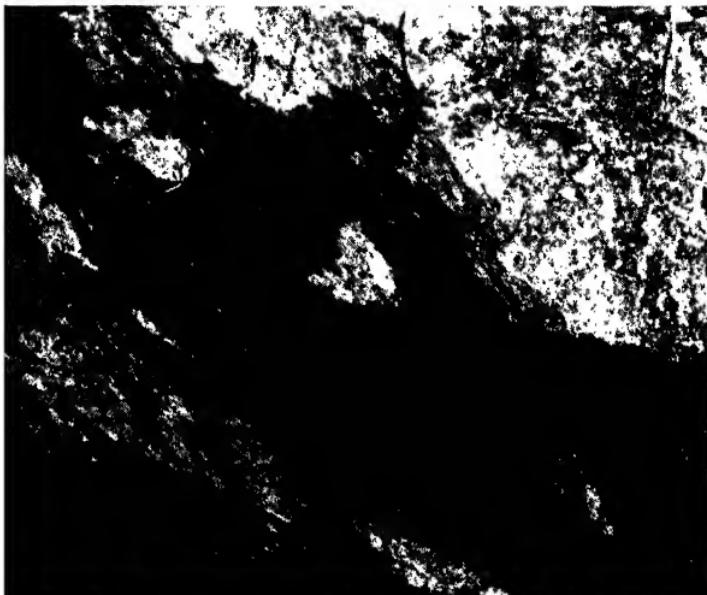
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than when in its natural state. There is an actual price to be paid for every rock garden—can you meet it?

A special knowledge of plants and materials is needed for this garden, not only in construction, but in operation. While a man with crude tools can build a hut for a night's shelter, he would not attempt a permanent home with the same equipment. The building of this special garden takes more skill than would seem possible, and the few good examples testify how infrequently the needed technique was at hand. Not only is the planning technical, but laborers who can carry out the work are rare; for a man who can use a spade or set out cabbages is not trained enough to follow instructions. The great puzzle of rock planting is that it requires methods and achieves results quite unlike normal gardening. Much of usual gardening craft must be forgotten.

With the warning that unusual skill and unforeseen expense are a part of the construction, we are ready for practical problems. The first is location. Many rock piles seem shot anywhere in the smooth lawn and are inhabited mostly by weeds. As a presentation of nature, this would seem to outrage both nature and art. If this garden cannot be made to appear to some degree at home in its surroundings, it

Alpine Cliff



Alpine Trail

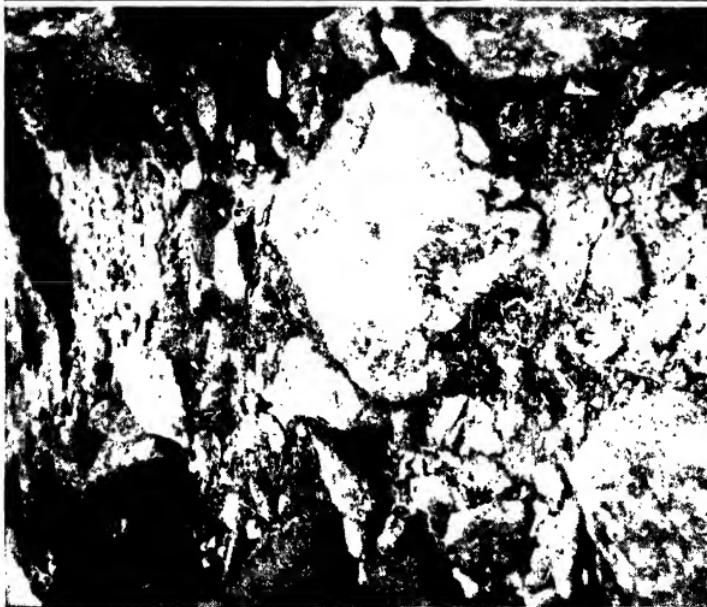


PLATE II.—ON MR. WASHINGTON



In Rock Garden with Sedum album

On Mt. Washington with no vegetation



PLATE III.—OVERHANGING ROCK

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would be better were the spot smooth lawn, a pool, a group of trees, or any normal kind of culture. If no rocks exist there, it would be folly, as a rule, to drag them in. The details of construction may be considered later; just now we decide whether or not a rock garden would be properly located anywhere on the property. The relation to other garden units is very vital. Since this garden reflects more of nature than art, it should be removed from the smooth lawn and formal garden, and linked with the wild garden (of which it is a part) in relation to woodland, water, marsh, or other undressed feature, and yet placed where the soil surface is uneven and where rocks appear to have some geologic reason for location.

Location and construction are primary considerations. Then comes the problem of the plants. The details of planting take a special chapter, but before beginning any making of lists we must realize that rock plants are those which are rarely used in other kinds of gardening and would largely be considered as weeds elsewhere. Some common plants can be grown anywhere by anyone, but real gems of the rock garden are very difficult of culture and have very rigid ideas of conditions under which they intend to thrive. For Primrose and Gentians, every soil

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pocket must be especially constructed for the needs of each species; and none of this effort is visible, since each little weed seems to be merely happily placed for good growth. After being planted, this area must be given special care at all seasons, or it soon becomes bare of rock plants and full of weeds. A knowledge of after-care will help in proper planning; and skill in construction and real insight into the requirements of each plant for best growth will reduce maintenance greatly; thus this garden will outlive the average. Theoretically, the rock garden thrives for many years, but often the love for it dies when the garden has gone wrong, and it rarely outlasts the enthusiasm of its owner.

Besides common rock gardening we may extend into special effects,—alps, wall gardens, stepping-stone walks, bog gardens, shade gardens, special groupings for season, flower effects, ecology combinations, and definite families or genera of plants. The planting may be made as elaborate as knowledge of vegetation permits and ability to provide the plants and means to maintain them will allow. There is no end to a rock garden—it is never complete even did every plant thrive wherever set out. Without doubt it is the most fascinating and difficult type of ornamental planting.

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There is a charm in the unusual surroundings for these plants, a relief from clipped lawn, formal trees, or well-ordered border. All possible use is made of the element of nature and yet all the order and art of man's garden training is also brought to bear upon it. A rough or rocky piece of ground, useless for agriculture, lawn, play area, or any human purpose, becomes the ideal site of a rock garden. What was worthless as real estate now becomes a garden.

The vegetation is wholly unlike that of formal or informal plantings. It is a type of its own, from a world apart, supposedly suggesting alpine peaks and barren crags as its home. Frequently, the smaller the plant, the more it is beloved, and tiny weeds less than an inch high (e. g. *Veronica repens*) are actually admired from kneeling position. The lure of rock plants is a special cult.

The rocks themselves lend an interest, and geology, though secondary, is added to alpine botany. There should be more plant surface than rock area in the finished effect; yet as the garden is bare of flowers many months of the year, the rocks and evergreen foliage are a vital part of the picture. This is essentially a spring garden, but with a special planting list it is possible to get good bloom in summer and autumn.

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FIG. 1.—NATURAL ROCK CREVICE

A rock garden may be built in any clime or country where rocks are available. The mechanical construction does not change, but the list of plants must vary greatly. A ledge of the Grand

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Canyon bears Cacti and Pentstemons; a cliff in Labrador blooms in Primrose and Saxifrage. Much of our garden practice has followed English climates and methods in attempt to grow the flora of the Alps, but by changing the plants used, a rock garden can be made wherever man may place the rocks.

II

PREPARATIONS

It is in the building of the rock garden that the first real difficulties are found. It seems simple indeed to toss a dozen rocks upon the ground and plant a few uncommon weeds among them. Before construction has proceeded far, the services of a geologist and a botanist are needed to help the gardener.

There are some dozen considerations to be kept in mind all at once and for all the time while placing the rocks. Each might be elaborated to a chapter, but if presented in outline the details will come naturally as the actual work of building progresses. Each is of great importance, and failure to give these due weight will mean that the garden will be like those usually seen, not very convincing in appearance and unsatisfactory to the plants as a home.

The rocks should be placed in as natural a manner as possible. When there are some boulders already on the site, it is not difficult to add others. An old stone quarry is a rock garden

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all prepared for minor changes and planting. Where the ground is uneven or sloping, it is not too much to imitate a rocky field, but on flat land, especially in city lots, to give a pile of rocks the appearance of Farmer Brown's barren stony pasture is a feat of great mental and physical agility. Stones native to the region are preferable, not so much because they are more cheaply and easily obtained, but for the effect of naturalness. The more the stones—after being placed—seem to have been deposited by natural forces, and thus attract little notice to themselves, the more attention will be given the plants; for this is a garden and not a geologist's pile of samples. The distance hauled is often governed by circumstances, as when carloads of rocks were transported from a New England town to Illinois. Though placed carefully on the bluffs of Lake Michigan, the owner refers to this area as the garden of precious stones. Rocks of brilliant color, or special character, are usually to be passed by, unless red sandstone or green slate is the common local rock formation.

In picking the stones there are many to be rejected. Too frequently, because of ease of handling, the rocks chosen are too small, and the garden resembles the chip pile of a stone-cutter's yard. Few stones should be used on the finished

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surface that are less than a foot in major diameter. This preserves naturalness and assures stability. The extreme of size is limited by the equipment for handling, but moving boulders of several tons is expensive as well as unnecessary. There is a rock garden in New England built on a slope where no stones existed, heaped with massive slabs laid up by a derrick, in effect of the Giant's Causeway rather than a deposit by the glacier. The larger stones should be not less than three feet in shortest diameter, of a weight that two men can move with bars, and horses or tractor can pull easily on a stone boat.

Stones of very soft structure, as some slates and sandstones, will melt in several winters of frost. These should not be used in any quantity or the garden will soon look like an ice palace on the approach of summer. Very hard stones, as quartz and trap, are very durable as foundation, but offer little weathered surface, for the growth of plants and vegetation will not clothe them. Rounded water-worn boulders are difficult to place to look stable; these egg-like rocks are to be used but little. The extreme of slab-like rocks is equally to be avoided—either they resemble stepping-stones when placed flat (use them all for walks) or when set on edge we have

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the garden of the dragon's teeth (page Jason). Of course, dressed stones, flagging, and lumps of concrete will be discarded.

The rocks, then, are not usually spherical nor slab-like, but irregular in shape. In general, they should be placed with long diameter nearly horizontal (when wholly visible) and somewhat parallel to the face of the slope as if they fell to this position from the mountain peaks above. Or the long pieces may be set into the bank to lock the pile more securely. On no account should they be set with long axis vertical, for this is contrary to the process of nature. No plants can grow on these pinnacles; they are continually being stumbled over and frost or a wet season loosens them and they fall over, to rest on choice plants.

The appearance of solidity should be also reality. As each rock is put into position, it should be so locked in place by its weight or relation to other rocks that it cannot move either now or after the action of rain and frost. While the workmen are placing them, a man with heavy tread should put his weight on each. If any slide, tilt, tip, or move in any way, they should be pulled out and reset. Repair work is difficult and exasperating after the plants have begun to grow, and yet every rock will slip which is left free to move.

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Here is where the workmen will offer unusable suggestions, for laying up rock gardens (for stability and desired garden effects) is quite different from constructing rubble wall with cement or dry wall with boulders. The placing of each stone is a special problem.

For stability, real and apparent, the largest rocks should usually be at the base of the pile, and those above successively smaller in size or so placed that the smaller end is visible. This not only ensures a firm position, but allows room for the plants. More than for geological truth, one must strive to suit the requirements of plants.

Plants grow in soil and not in air pockets, and your skilled stone mason must do gardener's work. It is usually impossible to convince a "walking delegate" that placing stones for a rock garden is non-union labor. No cement is ever used (except in Chinese rock gardens), and every crack and crevice is thoroughly rammed with soil. Every bit of earth has a direct connection with the soil beneath and down to the subsoil below the new construction. Poke around in the next rock garden that you visit—as full of holes as a prairie dog colony. Ram every crevice with soil, no matter how much the workmen grumble. This rockpile is to be dedicated to plants. Wherever one large rock goes upon another, the poor roots

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would be rather squeezed unless chips an inch or more in thickness take the weight from the soil strip. Egg-like pebbles used as chinkers will give the garden a rocking, rolling motion—save up broken bricks for flat laying and wedge-like chips for the uptilting next in order.

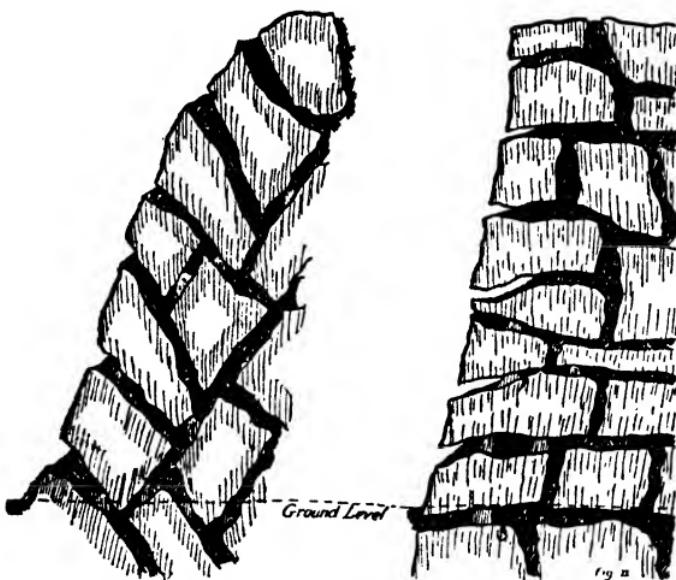


FIG. 2.—RIGHT AND WRONG CREVICE

Except in rare cases, all horizontal crevices should be far from level but sloping downward into the bank (never forward downward), the

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front of the rock so uptilted that rain runs easily down into the crevice. This requirement is not of geology or of art, but for the good health of

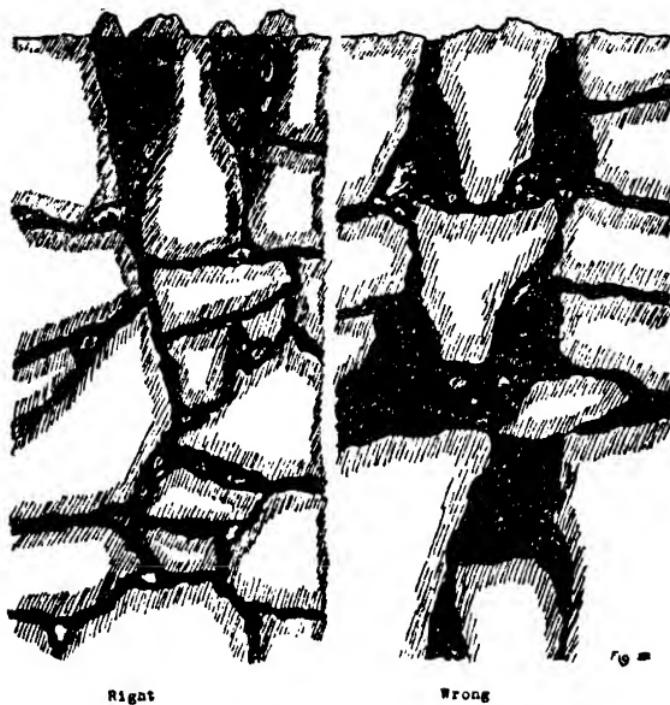


FIG. 3.—RIGHT AND WRONG FISSURE

the plants. Not only should the rocks tilt back from 10° to 45° or more, but each higher rock should be set back of the line of the lower, giv-

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ing the whole wall face a back slope, that each plant may have water, air, light, and room to grow. In staging this position, use judgment and vary the angle and line of the wall face, avoiding any appearance of regularity. One enthusiastic follower of these instructions overstressed painstaking regularity and achieved the monotony of the riprap of a canal bank.

All vertical fissures should be V-shaped, that the soil will rest firmly against the sides and leave no air pockets wherein roots will shrivel and die. When large crevices are to be divided, the stones should be wedge-like and dropped in *large end down*—quite unlike the usual way of burying stones—that the fissures may be still V-shaped from above.

The rock garden should usually be in full light and air, away from the shade of trees and structures, but full sun in summer (and winter) is very trying on many rock plants. It is wise to locate the garden so that the important sides face north or west, taking full advantage of the dew and cooling of every night, and to make the slopes facing the sun short and abrupt unless the vegetation is to be mostly Sedums and desert plants. To give further relief from the sun for a part of the day, hollows should be created in the level reaches, lowered at one side for drainage (unless

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bog plants are placed here), that the stones of the rim may cast shadows across them, whereas big boulders or ridges of rock may be erected boldly for the shade which they afford. A clever touch is to slope the whole area to the north at such an angle that the sun in winter will hardly hit the soil or at such a low angle that there will be no thawing. The problem of winter killing is largely controlled by angle of slope and shade from protruding boulders.



FIG. 4.—ORIENTATION OF ROCK GARDEN

Again, the requirements of many rock plants make necessary further choosing in the kind of stones to be used. Some plants grow best in an alkaline or lime soil. For these a lime rock, as marble or coral, should be used if available, or

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else lime rubble is mixed with the soil. For those which hate lime and demand acidity in the soil, a hard rock, (as granite) is needed, with plenty of peat fibre in the soil. Fortunately, many rock plants are neutral in these requirements.

While the stones are being gathered and hauled to the site, it is well to get the soil ready also. Ordinary garden soil will not do at all, nor will the best of garden soil—far from it! A soil that will raise prize lettuce is a fatal dose for alpines. While it might be said that each kind of rock plant requires a special mixture for its best diet, the general foundation for the majority of them is one-third sharp sand, one-third vegetable fibre, and one-third garden loam. These may be gathered separately and mixed just before being used. The ideal natural soil is the top sod of stony pastures, long rotted, and screened to take out roots of weeds. The sand should be sharp and gritty, even rather coarse, and never fine river sand or that containing clay. It is porosity that is required, and sifted hard coal ashes may be added, especially for lime lovers, like Dianthus.

The vegetable fibre may be from any source so long as it is well decayed,—old sod, leaf-mold, or turf from the woods. The best is peat from the bog piled a year ahead, pulverized by the frost of one winter, and dried by the sun of one

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summer. Then it will break into small pieces and is surely free of weed seed or roots. For city gardens it is most convenient to use any of the prepared peat fibres, as these are well ground and free from weeds. In any except special spots the coarse grades are better than the fine.

The garden loam should be free from clay and not of very fertile nature. It gives body to the mixture, the sand being porous and the fibre water-holding. The great danger is the presence of roots and seeds of common weeds, which soon will cause great trouble. Screening through a sieve will take out the roots of weeds, but the seeds will have to grow to their next stage. No fertilizer is ever added, save perhaps a little bone meal. Barnyard manure, in any stage, is forbidden, for it is too rich a diet for rock plants and is the original home of all weeds.

III

CONSTRUCTION

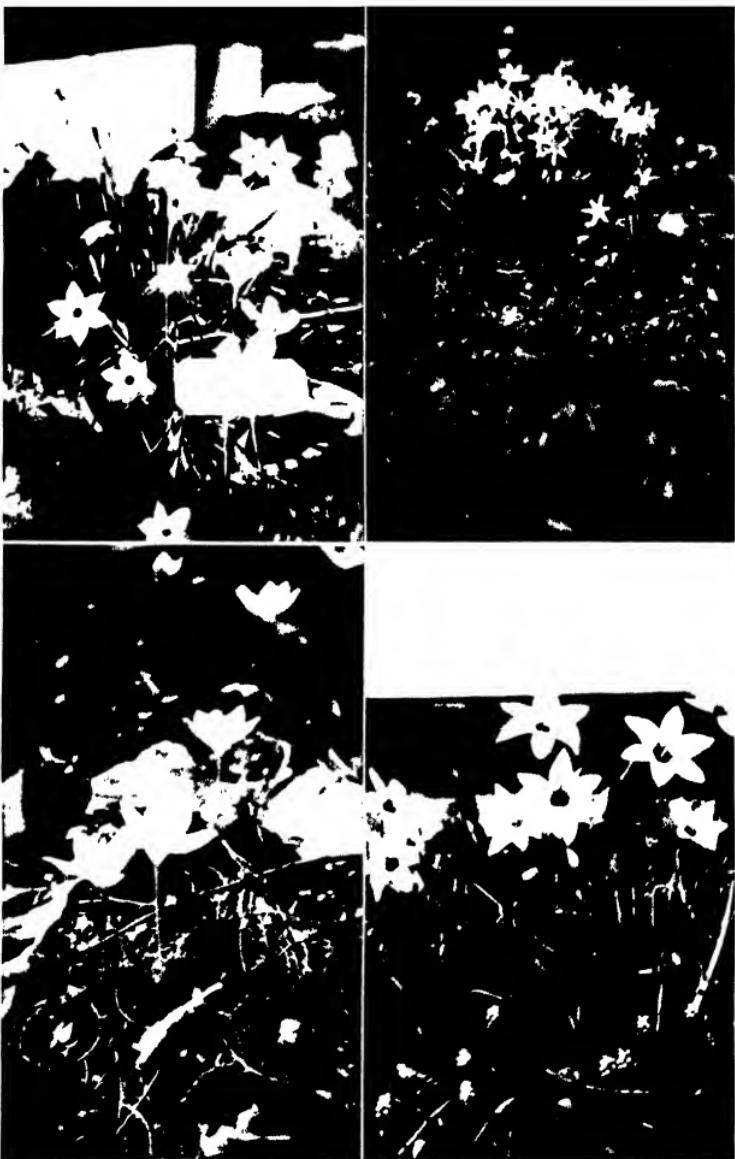
THE site is chosen, the stones are coming in a cart or on stoneboats, the soil has been made ready in piles, and the plants have been ordered. Now to work. First question, when is the best time of year to make a rock garden? The rocks and soil may be handled at any time except when the ground is frozen, but the summer months offer the longest period of freedom from planting rush, and then the soil is dry and easily handled. Then there will be autumn rains to make the soil firm and winter frost to settle the rocks; and planting can best be done the following spring.

The first operation is to dig off the existing top-soil (the first foot of earth) and remove the roots of all weeds and grasses. Much of this soil may be used in backfilling if all roots are sifted out. On this base the large bulky rocks should be laid, each packed around with soil, well rammed, and topped by several chinker stones before the next are put into place. As the program for procedure has already been arranged, the work of laying up the rocks can proceed.

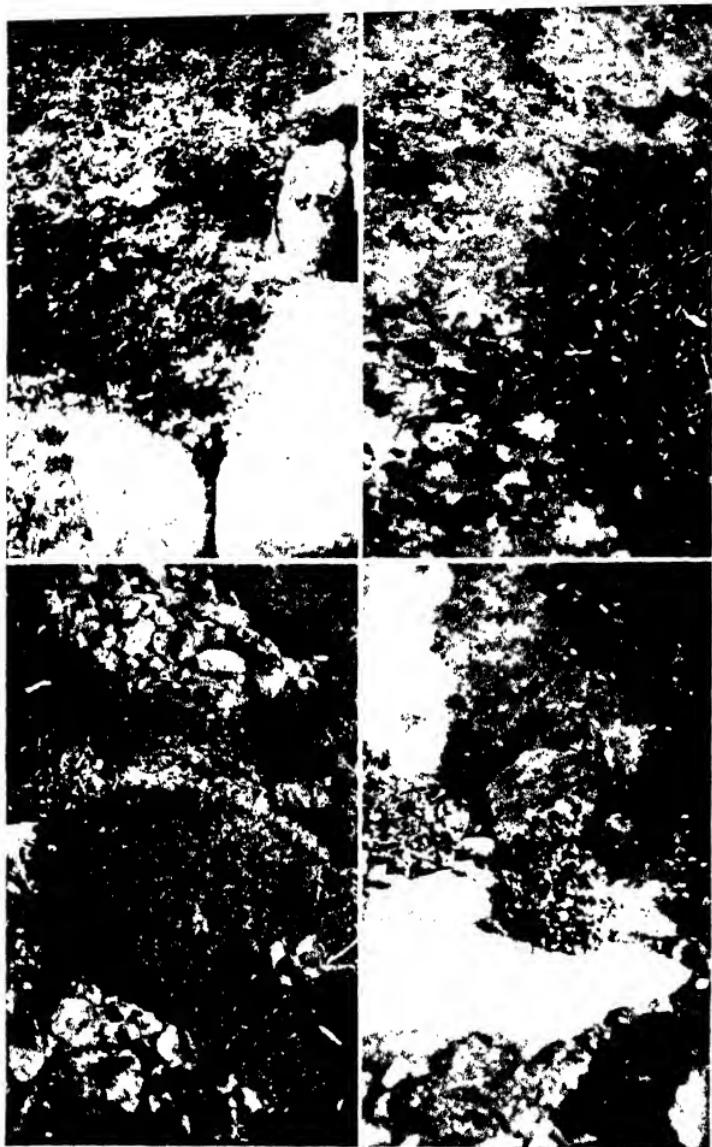
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Now is the time to worry over the details of the outline of the structure. While the general shape of the area may be decided in advance and even a plan may be at hand to give the principal elevations and major masses, the details of the shape of each crag and ravine must be decided as it is constructed. The aim is to give the greatest variety in configuration in a small compass, with an appearance of geologic truth and yet make the best possible home for each plant. For the best growth of many rock plants it is well to separate the groups by little walls of stones, making a pocket for each. Not only are they thus separated, but the plant roots will follow down the cool rock faces and withstand the rigors of summer and winter more safely. These pockets vary in size and shape, slope and relation to the sun, thus giving infinite variety in detail to the face of the garden. It would be best that the planting for each area be fairly definite in mind as the pockets are constructed. Though a detailed planting plan for a rock garden cannot be made on paper, the general arrangement of the plants should be decided as the construction proceeds. See Chapter XI.

Surface drainage is another worry at the time of construction. Most of the rock garden has sufficient slope to carry off excess rain. Too of-



Top left.—Spring Star-flower, *Triteleia uniflora*. *Top right*.—White Twinleaf Squill, *Scilla bifolia alba*. *Bottom left*.—Showy Crocus, *Crocus speciosus*. *Bottom right*.—Lady Tulip, *Tulipa clusiana*



Top.—Dwarf Bilberry, **Vaccinium caespitosum*. Bottom.—Diapensia, **Diapensia lapponica*

PLATE V.—ALPINE SHRUBS IN NATURE ON MT. WASHINGTON

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ten the little valleys become canyons worn by cloudbursts, when soil and plants are washed away. This must be foreseen and prevented by the laying of the stones. Some of the valleys should have deeper hollows to hold rain for a time, for such rock plants as Primroses and Gentians like their roots well watered. Actual watering of a rock garden is rarely needed, for with correct construction and proper planting the vegetation will withstand any normal dry season. Sub-irrigation is possible, and at time of construction perforated water pipe or porous drain tiles may be laid among the rocks, about a foot below the finished surface, the upper end to be connected to the water supply for an hour or more in extreme dry weather.

By the time that a few feet of finished rock face have been laid the need of walks for access and circulation will be obvious. Theoretically, in a rock garden the careful visitor may leap from rock to rock anywhere and observe every plant at close hand, but since every good garden is open to crowds of visitors at the height of its flowering season, walks must be provided far out of scale to the needs for caring for the plants and the size of the artificial hillside. Where the walking is greatest and the slope steep, it is best to lay down flat stones, often quickly using the avail-

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able supply of flattened rocks. Minor walks may be surfaced with sand, peat, or pine needles, to be covered by creeping plants like Thyme. On sharp slopes rough steps must be laid, not too irregular, and yet avoiding a finished effect. In the joints all kinds of tiny rock plants will be at home. The walks would normally follow the valleys, but at times run along the ridges. It is a nice problem to give easy walking service to visitors, access to all plants, and yet make an arrangement pleasing to the eye and not too much unlike natural trails.

As the rocks are laid in place, firmly locked and embedded, all freshly broken sides and the



FIG. 5.—ROCK STEPS

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faces originally discolored by the soil should be turned in out of sight; and the weathered, mossy, and lichenized areas turned to view. This gives the appearance of age and stability, but calls forth another complaint from your suffering workmen at your continued suggestions. If a stone rests best with broken face outward and mossy surface buried, why change it about? The only explanation I can give is that I am fussy and insist on its being changed about.

For the first part of the back fill of soil, the original soil of the site can be used (unless clay), but the last six to eight inches of soil below the finished surface should be of the special prepared mixture. This should be well rammed, pounded, pushed into every crevice, layer, and pocket with stone chips and pebbles put in for further drainage. With so loose a soil (mostly sand, pebbles, and fibre) there is no danger of pounding it too compactly; and rain and frost should not move it about much. A final layer of an inch of sand or shredded peat may be put on as a finishing touch, not so much for the neat effect as to keep out germinating weeds.

If the pockets are to be planted at once, the soil must be well watered, with great care to avoid washing the soil and loosening the rocks. It is best to wait several months from the time of

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construction to planting (summer construction and next spring planting), giving nature a chance to pass judgment on the new scenery before vegetation is added thereon. Also the weeds which got in during the building will show themselves and may be wholly excavated and eradicated while the pockets are otherwise empty.

IV

PLANTING

THREE chapters done and not a plant set out; this rock garden treatise is mostly about rocks. So a house in first phases of construction is mostly concrete, bricks, lumber, and nails. After the building of the rockwork is properly completed, we may forget that wholly, for its part will be done efficiently without further thought, and all our attention henceforth may be given to plants.

There may be said to be three sizes of rock plants in relation to time and manner of placing in the pockets. There are small shrubs and large field-grown clumps of sturdy herbs (as *Moss Phlox or Megasea Saxifrage) which are best planted when the rocks are laid in place, the roots of each being spread out and drawn back as much as possible, and soil, chinkers, and the next rock being laid upon them. They could scarcely be inserted later with a spade. Immediate effects are thus possible; and with care in watering through the first summer and a peat mulch the first winter, the accent and taller plant-

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FIG. 6.—ROOT SYSTEM OF ALPINES

ings can be in location in advance. In the crevices of the cliffs the planting is best put in while the cliff is being constructed.

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The major part of the planting should be done several months after construction. Of tough sorts (see list D in Chapter VI), small pieces may be planted with a little trowel in April, and with luck these will be good plants by midsummer and will give normal bloom the next year. But the first year of a rock plant is better in a special nursery. The start may be from seed, as Primrose (mostly obtained abroad); from cuttings, as Dianthus, first rooted in sand from a parent plant from a nursery or other garden; or from divisions, as Sedum, pulled from a large plant. (See lists I, J, K in Chapter VI). Seedlings, rooted cuttings, or divisions should each be finally potted in small pots not over 2" across and set closely in a cold frame. This should be done in early summer while construction is going on, and growth under this treatment will be better than in the newly finished rock garden. After a winter under a blanket of dry leaves in the frame each plant may be set directly in place and will start at once into bloom and growth, surviving all weather. These pot plants may be purchased from dealers, but there will be saving of time, if not in labor, if many of these may be produced by the owner, to be set out whenever wanted.

The third possibility is the sowing of seeds directly in place in spring, particularly in the tiny

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crevices, and after the plants have all been set out, choosing seeds of rock plants of easy germination. In a favorable season there may be good results, but often only the most weedy ones survive. Of expensive seeds better results will be assured by the previous method, and the sure-to-grow are really too certain to self sow and become weeds of little value. Examples are *Silene drummondii*, *Alyssum incanum*, *Silene viridiflora*, and *Lotus tenuis*. They are no better than Chickweed and Shepherd's Purse, though offered as good rock plants. A very sad experiment is the sowing of seed of easy small annuals for immediate effect the first year. After the first year they will be present for many years; and pulling out Portulaca, Sweet Alyssum, and Catchfly for many seasons is a punishment greater than the crime.

From habit of growth there are several types of rock plants; and their position is decided largely by their habit. Most distinct are the tufted plants, forming rosettes of foliage with short flower stalks above. These are for cliffs and tiny crevices, usually at the highest levels, and are the alpine vegetation. Such are Alpine Thrift (*Statice montana*), Tufted Saxifrage (**Saxifraga caespitosa*), Alpine Poppy (*Papaver*

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alpinum), Banded Pink (*Dianthus zonatus*), and Smooth Alumroot (**Heuchera glabra*).

Next there are dwarf erect plants of one foot in stature or less, small relatives of border plants. These are for the large flat areas and tops of ledges, where they are above the creeping sorts. These give *height* to the plantings. Try Rock Aster (**Aster alpinus*), Alpine Columbine (*Aquilegia alpina*), Yellow Pink (*Dianthus knappii*), Harebell (**Campanula rotundifolia*), and Mountain Phlox (**Phlox ovata*).

The drooping plants prefer to hang down over a rock face, growing in long streamers. These are best in the steep slopes near the top, though they smother any plants below them. On flat areas they soon crowd out smaller and less vigorous sorts. These are the plants that give foliage bulk to the rock garden and may be depended on to give the planting an effect of luxuriance, covering all blank spaces and even making the stones disappear in a sea of foliage. Goldentuft (*Alyssum saxatile*), Snow-in-Summer (*Cerastium tomentosum*), Evergreen Candytuft (*Iberis sempervirens*), Moss Phlox (**Phlox subulata*), and Carpathian Bellflower (*Campanula carpatica*) are examples of drooping plants of very vigorous growth.

The creeping sorts form close mats on the

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ground, rooting at the joints and covering the soil completely to a depth of a few inches. These fill in all tiny cracks in flat or sloping places, reaching across the stones after all the soil has been covered. For carpeting in the walks these are very useful, but this may not be sufficient domain and they clamber into the pockets and overwhelm the rare tufted kinds. Common Speedwell (**Veronica officinalis*), Maiden Pink (*Dianthus deltoides*), Creeping Phlox (**Phlox stolonifera*), Mother-of-thyme (*Thymus serpyllum*) and Stringy Stonecrop (*Sedum sarmentosum*) are very vigorous and crowding creepers.

Through such matted plants as these the little bulbs, as Snowdrop and Squills, (see List B, Chapter VI) will push their way and bloom in spring against a background of foliage; and when they dry away, there will be no patches of bare dirt above them.

All kinds of plants may be found in a modern rock garden, but some of them are hardly suitable. It might be well to put certain limitations upon what may be called a rock plant. Except in very large rock plantings or as special accent, a rock plant should not be more than a foot in height (or 30 cm) on the average. This restriction in height is necessary to keep the plants in scale with the scenery.

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Plants commonly seen in the flower border or elsewhere about the lawn should surely be omitted from the rock garden if the notion that this is a mountain slope with exclusive vegetation is to be maintained. Since this area is dedicated to plants too small or slender to be grown in the usual garden, the common garden plants should be kept out. But some plants, though small, are very much like weeds and grow far too well in the rock garden. Dandelion and Chickweed are persistent pests here, but no better are many others sold as rock plants. They are too troublesome as neighbors to better rock plants. There is no way to discover which are weeds except through trial.

Rock plants should thrive in full sun in poor sandy soil, either by means of deep root-system or fleshy stems and leaves. Those herbs which demand shade, moisture, or other special conditions are not for the usual rock garden; and discussion of their culture is made in Chapters VIII and IX. There are plenty of plants which will survive the baking heat of any summer if their bed has been properly constructed.

Of extreme importance as a character of a good rock plant is interest in flower, foliage, or habit of growth. In the hunt for more and newer rock plants any little weed on the side of the hill is

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dragged in by its Latin name and pronounced beautiful. There is no sense in cultivating tiny plants of little show in flower or foliage effect; yet many of such are extremely easy to grow, while Primroses from Yunnan or Saxifrages from the Alps seem most unwilling to thrive on a manufactured mountain in a foreign soil and climate.

V

MAINTENANCE

CONSTRUCTION was long and wearisome, and we have hardly begun to discuss the plants; but worse yet is the care needed by this garden from month to month. It ought to be true after the faithful following of instructions in these first chapters and careful choosing of plants from the lists of the next that the rock garden will then take care of itself and our only labor is to enjoy. But a rock garden is more to be waited upon than any other kind of ornamental garden, and the least neglect is quickly visible. A rock plant in its new home needs the care of a sick child, and a rock garden is an orphanage with all children ill of various troubles. Some plants grow thriftily for a year or two and then die off completely (these are biennials or monocarpic or of changeable minds); some never made any pretense of growing after being set out (these were on hunger strike from start); while others, seemingly small and meek, by roots and seeds soon intend to inherit the whole area. It is difficult enough to manage rock plants, but like

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the tares in the wheat-field come hordes of weeds, and all cannot be allowed to grow together till the harvest.

The routine of caring for a rock garden can best be followed by season. In early spring, before the ground is really thawed out (in cold climates), comes cleaning up. Dead tops, dead plants, and winter coverings should be removed and all made ready for new foliage and flowers soon to appear. This spring cleaning should be done early and thoroughly. As soon as the frost is out and the dead can be counted, there will always be replanting to fill in blanks. Stock should always be held in reserve in small pots in the frame for this, and new kinds can now be tried.

With the first flowers the foliage of perennial weeds will appear. There is nothing else to be done but to dig in and remove every piece of root, even if this means lifting and resetting the rock plants. It is often necessary to lift out the contents of the pocket and pick a choice plant from the mass of weed roots. There is no sense in postponing this task; the sooner done, the easier. As soon as flowers appear in any quantity, the spring work must stop, for walking on the plants and turning them about to get at the weeds rather ruins the present floral effect. From April through June (the height of the flower

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show) there should be nothing to be done except enjoy the display and answer the questions of visitors.

Seed gathering begins in June, for many rock plants mature their seeds early. Some seed is for sowing, some for exchange; but of many plants of easy culture the seed must be gathered while green and destroyed, or the self-sown seedlings will become too numerous. In early summer, too, comes making divisions and cuttings of such special plants of which greater increase is desired.

Annual weeds, and such perennial sorts as eluded your spring search, are now well above the foliage of the rock plants. These should be broken off close to the ground (not pulled up), for breaking will destroy the annual weeds, while the perennial sorts are to be gathered in the autumn cleaning. Loosening the soil in the summer months, even to pull a weed, allows the soil to dry out and all existing moisture must be saved. The soil surface should be entirely covered with foliage and beneath this and on the under side of the stones there will be sufficient moisture for any proper rock plant. If there be spots of bare baked soil, cover with broken peat or coarse sand.

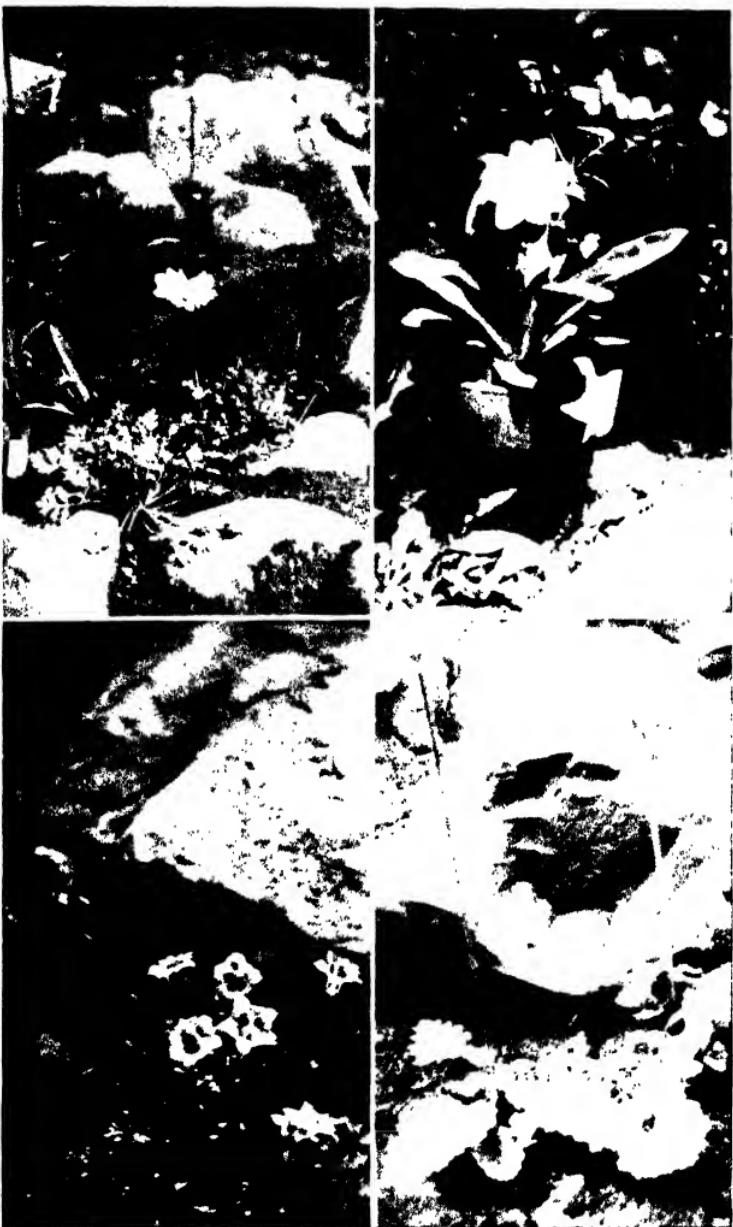
In periods of a month without rain, some of

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the rock plants will become wilted. Either the soil preparation was not carefully done or these are bog plants. Rebuild the pockets next autumn and shift the plants. Watering with the hose is legally allowable, though not a natural process, but if squirted on too forcibly the water digs up plants and stones and washes away the soil. If the site is really desert-like, and other than Cacti and Sedums are desired, it is simple and effective to install sub-irrigation by means of leaking water pipe or tile during construction.

With the first cool of autumn and moisture of rains, there is quite a display of bloom and much stem growth for next year. After frosts have closed the season, the heavy weeding of perennial pests must be undertaken. Now every piece of weed will have a visible top, and there is no excuse for not getting them wholly and forever removed.

Some rock plants will have grown too well by roots or by seed, and these should be thoroughly thinned; others will have too much top and smother their neighbors. For such cases a big knife should give a severe Dutch cut or a pruning of the tangle. For better bloom the next spring, this cutting should be done in early summer after bloom; but the foliage effect is injured until new growth has come out. Some replanting



Top left.—Alpine Poppy, *Papaver alpinum*. *Top right*.—



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must be done in the autumn (late August to October), but where winter heaving is severe, it is better to set out in the spring. With a mulch of peat or dry hay, large potted plants will survive any winter safely.

Lastly comes the decision as to winter protection of special coverings. Short is this paragraph —omit all special coverings. If the plants have good tops or a mulch of peat and sand about the crowns, and construction below is as it should have been, any rock plant will come through the winter safely, if at all hardy in that latitude. No covering at all is easiest and best. It is better to put the plants at the mercy of an open winter than to smother with blankets of hay, leaves, or manure. None of these fall in the winter on the slopes of Pikes Peak; yet the mountain plants survive. Those plants which are found to be not hardy should be supplanted by those which are more enduring. Not only are hay and manure certain to rot the plants, but they bring in weed seeds and harbor mice, which chew the plants. A few pieces of evergreen boughs may be laid on exposed spots, but a little coarse sand about the crowns is better. The rock plants really difficult of culture will be treated in Chapter VIII, for there are many rock plants which tax the skill of expert gardeners.

VI

LISTS

EVERY enthusiast wants lists of plants, and rock garden descriptions are full of them. So here are more, compiled with special reference to conditions of northeastern United States. All these plants are obtainable in the American trade or as seeds from abroad. These lists are not intended to be complete, but suggest a start for any garden. The names marked with an * are native American plants. As suggestion for native rock plants, you are referred to the lists in "Horticulture" 1927-1928:

Nov. 1, 1927—New England Rock Plants,
p. 434.

Dec. 15, 1927—From the North, p. 479.

Jan. 1, 1928—From the Middle States, p. 19.

Jan. 15, 1928—From Southern Alleghenies,
p. 35.

Mar. 1, 1928—From the Prairies and Plains,
p. 115.

Apr. 15, 1928—From Colorado and the Central
Rocky Mountains, p. 200.

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May 1, 1928—From the Southern Rockies,
p. 234.

June 15, 1928—From the Northwest, p. 305.

A.—EVERGREEN FOLIAGE

For best effect all the year a good part of the rock plants should have evergreen foliage. These are really small shrubs but are usually classed as perennials. Even if they never bloom, the neat mats of foliage give interest the year through. There are more than two hundred species which are evergreen and hardy in the latitude of Boston—

- Achillea clavennae*, Silver Alpine Yarrow
 - tomentosa*, Woolly Yarrow
- Alyssum argenteum*, Silver Alyssum
 - gemonense*, German Alyssum
 - saxatile*, Goldentuft
 - spinosum*, Spiny Alyssum
- Arabis albida*, Wallcress
 - aubrietoides*, Aubrieta Wallcress
- Artemisia lanata*, Alpine Wormwood
 - glacialis*, Glacier Wormwood
- Aubrieta deltoidea*, Aubrieta
- Dianthus alpinus*, Alpine Pink
 - arenarius*, Sand Pink
 - brevicaulis*, Shortstem Pink
 - caesius*, Cheddar Pink

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- neglectus*, Smaller Ice Pink
- petraeus*, Ledge Pink
- zonatus*, Banded Pink, etc.
- **Dryas octopetala*, White Mountain Avens
 - **drummondii*, Drummond Mountain Avens
 - sundermannii*, Sundermann Mountain Avens
- Euphorbia myrsinifolia*, Evergreen Spurge
- **Heuchera americana*, American Alumroot
 - **glabra*, Smooth Alumroot
 - **glabella*, Glacier Alumroot
 - **pilosella*, Downy Alumroot
 - **rubescens*, Reddish Alumroot
 - **sanguinea*, Coralbells
 - **undulata*, Wavy Alumroot, etc.
- Iberis sempervirens*, Evergreen Candytuft
 - tenoreana*, Tenore Candytuft
- Micromeria croatica*, Croatian Savory
- Nepeta mussini*, Mussin Catmint
- Origanum vulgare*, Wild Marjoram
- **Pentstemon arizonicus*, Arizona Pentstemon
 - **humilis*, Low Pentstemon
 - **labrosus*, Longlip Pentstemon
 - **menziesii*, Menzies Pentstemon
 - **palmeri*, Palmer Pentstemon
 - **rupicola*, Cliff Pentstemon
 - **scouleri*, Scouler Pentstemon, etc.
- **Phlox alyssifolia*, Madwort Phlox
 - **amoena*, Amoena Phlox

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- **brittonii*, Britton Phlox
- **condensata*, Tufted Phlox
- **douglasii*, Douglas Phlox
- **hoodii*, Hood Phlox
- **multiflora*, White Alpine Phlox
- **ovata*, Mountain Phlox
- **stellaria*, Mauve Phlox
- **subulata*, Moss Phlox, etc.
- **Potentilla tridentata*, Wineleaf Cinquefoil
- **Caespitosa*, Saxifraga, Tufted Saxifrage
 - cordifolia*, Heartleaf Saxifrage
 - crassifolia*, Leather Saxifrage, etc.
- **Sedum acre*, Goldmoss
 - album*, White Stonecrop
 - reflexum*, Jenny Stonecrop
 - rupestre*, Cliff Stonecrop
 - sexangulare*, Hexagon Stonecrop
 - **spathulifolium*, Cascade Stonecrop
 - stoloniferum*, Running Stonecrop, etc.
- Sempervivum* (many species), Houseleek
- Teucrium chamaedrys*, Chamaedrys Germander
- Thymus serpyllum*, Mother-of-thyme
 - nitidus*, Shining Thyme
- Veronica incana*, Woolly Speedwell
 - **officinalis*, Common Speedwell
 - pectinata*, Comb Speedwell
 - rupestris*, Cliff Speedwell
 - satureioides*, Savory Speedwell
 - saxatilis*, Rock Speedwell, etc.
- **Yucca harrimanae*, Harriman Yucca

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B.—SMALL BULBS

Among the evergreen perennials the small bulbs may be placed, blooming more effectively here than against bare dirt. All of these are, of course, absolutely hardy, long-lived, and of easiest culture.

- Allium angulosum, Angled Onion
 - carinatum, Keeled Onion
 - *cernuum, Nodding Onion
 - flavum, Yellow Onion
 - *reticulatum, Fraser Onion
 - *stellatum, Prairie Onion, etc.
- *Brodiaea capitata, Common Brodiaea
 - *lactea, White Wild-hyacinth
 - *laxa, Triplet Brodiaea, etc.
- Bulbocodium vernum, Spring Meadow-saffron
- *Calochortus elegans, Elegant Star-tulip
 - *nitidus, Purple-eye Mariposa
 - *nuttallii, Sego-lily, etc.
- Chionodoxa luciliae, Glory-of-the-Snow
- *Cooperia drummondii, Evening-star
- Crocus chrysanthus, Giant Yellow Crocus
 - speciosus, Showy Crocus
 - zonatus, Banded Crocus, etc.
- *Erythronium albidum, White Troutlily
 - *californicum, California Troutlily, etc.
- *Fritillaria glauca, Siskiyou Fritillary
 - *pudica, Yellowbell Fritillary
 - *recurva, Scarlet Fritillary, etc.

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- Leucojum vernum*, Spring Snowflake
**Lilium grayi*, Gray's Lily
 —**parvum*, Sierra Lily
 —*tenuifolium*, Coral Lily
Muscari botryoides, Common Grape-hyacinth
Narcissus bulbocodium, Petticoat Daffodil
 —*juncifolius*, Rush-leaf Daffodil
 —*minor*, Baby Daffodil
 —*triandrus*, Angels-tears
Scilla amoena, Levant Squill
 —*bifolia*, Twinleaf Squill
 —*sibirica*, Siberian Squill
Triteleia uniflora, Spring Star-flower
Tulipa clusiana, Lady Tulip
 —*humilis*, Dwarf Tulip
 —*linifolia*, Grass-leaf Tulip
 —*pulchella*, Dwarf Rose Tulip, etc.
**Zephyranthes atamasco*, Atamasco-lily, etc.

C.—ROCK FERNS

For true beauty of foliage, many of the small ferns are useful. Some are evergreen; some require partial shade and moisture; whereas a few are limelovers and prefer full sun. They are not so easy of culture as most herbs, but they add grace of foliage to selected spots among the rocks. See also Chapter IX. These are all American sorts. Apparently European ferns are not growing in this country. Spores sent from Europe do

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not germinate at all. However, there are plenty of native ferns, and too few are actually in gardens.

- **Asplenium montanum*, Mountain Spleenwort
 - **platyneuron*, Ebony Spleenwort
 - **ruta-muraria*, Wall-rue Spleenwort
 - **trichomanes*, Maidenhair Spleenwort
 - **vespertinum*, Western Spleenwort
 - **viride*, Green Spleenwort, etc.
- **Cheilanthes alabamensis*, Alabama Lipfern
 - **californica*, California Lacefern
 - **covillei*, Coville Lipfern
 - **feei*, Slender Lipfern
 - **fendleri*, Fendler Lipfern
 - **gracillima*, Lacefern
 - **lanosa*, Hairy Lipfern
 - **tomentosa*, Woolly Lipfern, etc.
- **Cryptogramma acrostichoides*, American Rock-brake
 - **stelleri*, Slender Rockbrake
- **Cystopteris bulbifera*, Berry Bladderfern
 - **fragilis*, Brittle Bladderfern
- **Notholaena californica*, California Cloakfern
 - **dealbata*, Powdery Cloakfern
 - **parryi*, Parry Cloakfern
- **Pellaea atropurpurea*, Purple Cliffbrake
 - **brachyptera*, Sierra Cliffbrake
 - **breweri*, Brewer Cliffbrake
 - **bridgesii*, Bridges Cliffbrake

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- **densa*, Podfern
- **mucronata*, Birdfoot Cliffbrake, etc.
- **Phyllitis scolopendrium*, Hartstongue
- **Polypodium californicum*, California Polypody
 - **falcatum*, Licorice Fern
 - **polypodioides*, Resurrection Fern
 - **vulgare*, Common Polypody, etc.
- **Woodsia alpina*, Alpine Woodsia
 - **glabella*, Smooth Woodsia
 - **ilvensis*, Rusty Woodsia
 - **obtusa*, Common Woodsia
 - **oregana*, Oregon Woodsia
 - **scopulina*, Rocky Mountain Woodsia, etc.

D.—EASY ROCK PLANTS

Some plants thrive under any treatment and will endure any conditions imposed upon them by man. Many are not always very lovable, yet the following are not only tough but worthy. This may be considered as a fool-proof list. These are persistent sorts that can not be killed.

- Achillea clavennae, Silver Alpine Yarrow
 - tomentosa*, Woolly Yarrow
- Alyssum saxatile, Goldentuft
- *Anemone patens nuttalliana, American Pasque-flower
 - pulsatilla*, European Pasqueflower
- *Antennaria dioica, Common Pussytoes
 - **plantaginifolia*, Plantainleaf Pussytoes

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- Aquilegia alpina*, Alpine Columbine
 - **caerulea*, Colorado Columbine
 - **canadensis*, American Columbine
- Arabis albida*, Wallcress
 - aubrietioides*, Aubrietia Wallcress
 - mollis*, Downy Rockcress
- Arenaria banatica*, Banatian Sandwort
 - grandiflora*, Showy Sandwort
- Artemisia glacialis*, Glacier Wormwood
 - mutellina*, Alpine Wormwood
- **Aster alpinus*, Rock Aster
 - brachytrichus*, Shorthair Aster
 - **ptarmicoides*, White Upland Aster, etc.
- *Aubrieta deltoidea*, Aubrieta
- *Campanula carpatica*, Carpathian Bellflower
 - **rotundifolia*, Harebell, etc.
- *Cerastium grandiflorum*, Large-flower Cerastium
 - tomentosum*, Snow-in-summer
- *Doronicum caucasicum*, Caucasian Leopardbane
- *Erodium manescavi*, Pyrenees Heronbill
- *Geranium macrorrhizum*, Bigstem Cranesbill
 - sanguineum*, Bloodred Cranesbill
- **Geum peckii*, Yellow Mountain Avens
- **Heuchera* (all species), Alumroot
- *Iberis sempervirens*, Evergreen Candytuft
 - tenoreana*, Tenore Candytuft
- **Iris arenaria*, Sand Iris
 - **cristata*, Crested Iris
 - gracilipes*, Slender Iris
 - **lacustris*, Lake Iris

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- pumila*, Dwarf Crimean Iris
- verna*, Vernal Iris, etc.
- Lathyrus vernus*, Spring Bittervetch
- Linum alpinum*, Alpine Flax
 - campanulatum*, Yellowbell Flax
 - *lewisii*, Prairie Flax
- Lotus corniculatus*, Birdsfoot Trefoil
 - siliquosus*, Larger Trefoil
- **Oenothera pumila*, Small Sundrops
 - *speciosa*, Showy Sundrops, etc.
- **Opuntia arenaria*, Sand Cactus
 - *fragilis*, Brittle Prickly-pear
 - humifusa*, Western Prickly-pear
 - *polyacantha*, Many-spine Prickly-pear
 - *vulgaris*, Eastern Prickly-pear, etc.
- **Pentstemon alpinus*, Alpine Pentstemon
 - *glaber*, Blue Pentstemon
 - *scouleri*, Scouler Pentstemon, etc.
- **Phlox amoena*, Amoena Phlox
 - *brittoni*, Britton Phlox
 - divaricata*, Blue Phlox
 - *pilosa*, Downy Phlox
 - *stellaria*, Mauve Phlox
 - *stolonifera*, Creeping Phlox
 - *subulata*, Moss Phlox, etc.
- Potentilla alba*, White Cinquefoil
 - *argentea*, Silver Cinquefoil
 - gelida*, Icefield Cinquefoil
 - nitida*, Shining Cinquefoil
 - nivea*, Snowy Cinquefoil

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- pyrenaica*, Pyrenees Cinquefoil
- **tridentata*, Wineleaf Cinquefoil, etc.
- Saponaria ocymoides*, Rock Soapwort
- **Saxifraga caespitosa*, Tufted Saxifrage
 - cordifolia*, Heartleaf Saxifrage
 - **virginiensis*, Virginia Saxifrage, etc.
- **Sedum acre*, Goldmoss
 - album*, White Stonecrop
 - altissimum*, Tall Stonecrop
 - reflexum*, Jenny Stonecrop
 - rupestre*, Cliff Stonecrop
 - sarmentosum*, Stringy Stonecrop, etc.
- Sempervivum* (many kinds, over 100), Houseleek
- Silene maritima*, Sea Campion
 - schafta*, Schafta Catchfly
 - **virginica*, Firepink, etc.
- Thalictrum alpinum*, Arctic Meadowrue
 - **dioicum*, Early Meadowrue
- Tunica saxifraga*, Saxifrage Tunicflower
- Veronica rupestris*, Cliff Speedwell
 - saxatilis*, Rock Speedwell, etc.
- Viola cornuta*, Tufted Pansy

E.—LATE SUMMER BLOOM

For bloom after July first the list is not long. It is unfortunate that the peak of the bloom is in the spring, though many herbs give some bloom for all summer. With all the new plants discov-

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ered on distant peaks, very few are summer bloomers at low altitudes.

- **Allium stellatum*, Prairie Onion
- **Anaphalis margaritacea*, Pearl Everlasting
- **Aster linariifolius*, Pine Aster
 - **ptarmicoides*, White Upland Aster
- **Boltonia latisquama nana*, Dwarf Pinkray Boltonia
- **Chrysanthemum arcticum*, Arctic Chrysanthemum
- **Chrysopsis falcata*, Sickle-leaf Golden-Aster
- Cimicifuga japonica*, Japanese Bugbane
 - simplex*, Kamchatka Bugbane
- Crocus sativus*, Saffron Crocus
 - speciosus*, Showy Crocus
 - zonatus*, Banded Crocus, etc.
- Linaria alpina*, Alpine Toadflax
- **Paronychia dichotoma*, Forked Nailwort
- Sedum ewersii*, Ewers Stonecrop
 - sieboldii*, Siebold Stonecrop
 - spectabile nanum*, Dwarf Showy Stonecrop
- Silene schafta*, Schafta Catchfly
- **Solidago caesia*, Wreath Goldenrod
 - **cutleri*, Cutler Alpine Goldenrod
- Tunica saxifraga*, Saxifrage Tunicflower
- Zephyranthes candida*, Autumn Zephyr-lily

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F.—WALKS AND STEPPING STONES

For the crevices in walks surfaced with flat stones, only the most dwarf or wiry of rock plants should be used. Fleshy plants, as Sedums, are too slippery when walked on, and Iberis and Alyssum become hurdles over which the traveler must leap.

Acaena microphylla, New Zealand Bur

**Antennaria neodioica*, Smaller Pussytoes

—**plantaginifolia*, Plantainleaf Pussytoes

Arenaria montana, Mountain Sandwort

—*verna*, Tufted Sandwort

—**verna caespitosa*, Moss Sandwort

Cotula squalida, Creeping Mayweed

Dianthus caesius, Cheddar Pink

Draba olympica, Olympic Whitlowgrass

Epilobium nummularifolium, Moneywort Willow-weed

Gypsophila repens, Creeping Gypsophila

—*cerastioides*, Mouse-ear Gypsophila

Herniaria glabra, Burstwort

**Houstonia serpyllifolia*, Creeping Bluets

**Paronychia argyrocoma*, Allegheny Nailwort

Sagina glabra, Smooth Pearlwort

Sempervivum arachnoideum, Spiderweb Houseleek

**Silene acaulis*, Moss Campion

Statice montana, Alpine Thrift

**Stellaria longipes*, Long-stalk Chickweed

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- Thymus serpyllum albus*, Whiteflower Thyme
—*lanuginosus*, Woolly Thyme
Veronica repens, Creeping Speedwell
—*rupestris nana*, Dwarf Cliff Speedwell
—*saxatilis*, Rock Speedwell
—**serpyllifolia*, St. Paul Speedwell

G.—ACID SOIL ROCK PLANTS

Fortunately, most rock plants will thrive in either acid or lime soil. Several groups of plants prefer acid soil conditions, particularly in conjunction with constant moisture and leafmold. The following grow readily in sunny spots, but not where the soil is at all alkaline. No list of any length on this subject has yet been compiled. These are the calciphobe or calcifuge plants, since they hate lime and flee from it. The Heath, Lily, and Orchid families are good examples. Try the aluminum sulfate treatment on them if the soil is not naturally acid and use plenty of peat in the soil mixture.

- Achillea atrata*, Black Yarrow
—*moschata*, Musk Yarrow
Androsace alpina, Alpine Rock-jasmine
—*carnea*, Pine Rock-jasmine
Anemone alpine sulfurea, Yellow Alpine Anemone
—*blanda*, Greek Anemone

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- **quinquefolia*, American Wood Anemone,
etc.
- **Arethusa bulbosa*, Arethusa
- Astilbe simplicifolia*, Star Astilbe
- **Calopogon pulchellus*, Grass-pink Orchid
- **Calypso borealis* (*Calypso bulbosa*), Calypso
- **Chimaphila maculata*, Striped Pipsissewa
 - **umbellata*, Common Pipsissewa
- **Chiogenes hispidula*, Creeping Snowberry
- **Coptis trifolia*, Goldthread
- **Epigaea repens*, Trailing-arbutus
- **Gaultheria procumbens*, Wintergreen
- **Gentiana affinis*, Sierra Gentian
 - alpina*, Alpine Gentian
 - cruciata*, Cross Gentian
 - kochiana*, Koch Gentian, etc.
- **Houstonia caerulea*, Bluets
- **Iris verna*, Vernal Iris
- **Linnaea borealis*, Twinflower
- **Moneses uniflora*, Oneflower Wintergreen
- **Orchis spectabilis*, Showy Orchid
- **Parnassia caroliniana*, Carolina Parnassia
 - **palustris*, Marsh Parnassia
- **Pogonia ophioglossoides*, Rose Pogonia
- **Potentilla tridentata*, Wineleaf Cinquefoil
- Primula elatior*, Oxlip Primrose
 - **farinosa*, Birdseye Primrose
 - viscosa*, Clammy Primrose, etc.
- **Pyrola elliptica*, Shinleaf
- **Shortia galacifolia*, Oconee-bells

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- **Sibbaldia procumbens*, Creeping Sibbaldia
- Silene rupestris*, Cliff Catchfly
- Soldanella* (all species)
- **Streptopus roseus*, Rosy Twistedstalk
- **Thalictrum dioicum*, Early Meadowrue
 - minus, Low Meadowrue
- **Trillium nivale*, Dwarf Trillium
 - **rivale*, Brook Trillium
- Trollius chinensis*, Chinese Globeflower
 - **laxus*, American Globeflower

H.—ALKALINE SOIL ROCK PLANTS

Many rock plants make poor growth in soil slightly acid or neutral, though some large groups, as *Anemone*, *Gentiana*, *Iris*, and *Primula* have a family disagreement, and certain species are sharply set apart from their relatives in soil preference, some asking acid and others demanding lime. In a region of soil normally acid (one of leafmold with heavy rainfall), the soil must be doctored with lime, or the culture of the alkali lovers is hopeless. These are the calciphiles or calcitropes, for they love lime and turn toward it; for example, the Clover and the Mustard families. As a group, they like dry conditions in full sun and are true subjects for a rock garden. Broken mortar, from plastering or brickwork, and ashes from hard coal may be used in the soil mixture in

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place of sand. The wild flowers from our western plains (not from the high mountains, which give acid conditions) grow poorly in New England. Possibly they regret the lack of their native alkali.

Aethionema (all species)

Androsace chamaejasme, Dwarf Rock-jasmine

—*helvetica*, Swiss Rock-jasmine

—*pubescens*, Downy Rock-jasmine

Anemone alpina, Alpine Anemone

Anthyllis montana, Mountain Woundwort

**Arenaria verna*, Tufted Sandwort

**Asplenium ruta-muraria*, Wall-rue Spleenwort

—**viride*, Green Spleenwort

Astragalus hypoglottis, Tongue Milkvetch

Aubrieta deltoidea, Aubrieta

**Camptosorus rhizophyllus*, Walking Fern

**Cryptogramma stelleri*, Slender Rockbrake

Dianthus alpinus, Alpine Pink

—*glacialis*, Ice Pink

—*zonatus*, Banded Pink, etc.

**Draba arabisans*, Rockcress Whitlowgrass

—**incana*, Hoary Whitlowgrass

Erysimum rupestre, Asiatic Blistercress

Gentiana angustifolia, Narrowleaf Gentian

—*clusii*, Clusius Gentian

Helianthemum canum, Hoary Sunrose

**Heuchera* (all species)

Hippocrepis comosa, Tufted Horseshoe-vetch

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- Hutchinsia alpina, Alpencress
- Iris pumila, Dwarf Crimean Iris
- *Lesquerella alpina, Alpine Bladderpod
 - *argentea, Silvery Bladderpod
- Linaria petraea, Cliff Toadflax
- *Lithospermum linearifolium, Lineleaf Puccoon
- *Notholaena dealbata, Powdery Cloakfern
- *Opuntia arenaria, Sand Cactus
 - *vulgaris, Eastern Prickly-pear, etc.
- *Oxytropis lamberti, Stemless Locoweed
 - *splendens, Showy Oxytrop
- Papaver alpinum, Alpine Poppy
- *Pellaea atropurpurea, Purple Cliffbrake
 - *densa, Podfern
- *Phyllitis scolopendrium, Hartstongue
- *Primula mistassinica, Dwarf Canadian Primrose,
etc.
- *Saxifraga aizoides, Yellow Mountain Saxifrage
 - *aizoon, Aizoon Saxifrage
 - *oppositifolia, Twinleaf Saxifrage, etc.
- Sempervivum (all species)
- *Woodsia ilvensis, Rusty Woodsia
 - *obtusa, Common Woodsia
 - *oregana, Oregon Woodsia
 - *scopulina, Rocky Mountain Woodsia

I.—EASILY RAISED FROM SEED

The greater part of rock plants set seed and at least nine-tenths may be easily raised there-

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from; yet some groups are extremely difficult (See "The House Beautiful," May 1927, "Success with Seeds of Alpines"). The greatest variety of seeds of rock plants is obtainable from American as well as European dealers.

<i>Achillea</i> (all species)	<i>Hypericum</i> (most species)
<i>Aethionema</i> (all species)	<i>Iberis</i> (all species)
<i>Allium</i> (all species)	<i>Lathyrus vernus</i>
<i>Alyssum</i> (all species)	<i>Linaria alpina</i>
<i>Anemone</i> (many species)	<i>Linum</i> (all species)
<i>Aquilegia</i> (all species)	<i>Lotus</i> (all species)
<i>Arabis</i> (all species)	<i>Lychnis</i> (all species)
<i>Arenaria grandiflora</i>	<i>Mimulus</i> (all species)
<i>Aster alpinus</i> , etc.	<i>Papaver</i> (all species)
<i>Astragalus</i> (all species)	* <i>Pentstemon</i> (all species)
<i>Aubrieta</i> (all species)	<i>Phyteuma</i> (all species)
<i>Campanula</i> (all species)	<i>Potentilla</i> (many species)
<i>Cheiranthus</i> (all species)	<i>Primula</i> (many species)
<i>Corydalis</i> (many species)	<i>Sedum</i> (many species)
<i>Dianthus</i> (all species)	<i>Sempervivum</i> (all species)
<i>Draba</i> (all species)	<i>Silene</i> (all species)
<i>Erigeron</i> (all species)	<i>Statice montana</i>
<i>Erodium</i> (all species)	<i>Thalictrum alpinum</i>
<i>Gentiana</i> (many species)	<i>Tunica saxifraga</i>
<i>Geranium</i> (many species)	<i>Viola cornuta</i>
<i>Geum</i> (all species)	—all species
<i>Helianthemum</i> (all species)	

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J.—EASILY GROWN FROM CUTTINGS

During midsummer, in a shaded frame, in moist sand, many rock plants may be increased rapidly from cuttings, like geranium slips on a small scale. Where seed or division are not possible, this is the commercial method of quick multiplication. One plant will soon make twenty small ones. The Mustard, Pink, Sedum, Mint, and Composite families are mostly examples of growth from cuttings.

Aethionema (all species)	Iberis (all species)
Alyssum (all species)	Nepeta mussini
Arabis (all species)	*Pentstemon (all species)
Arenaria (all species)	*Phlox (all species)
Artemisia (rock species)	Saponaria ocymoides
Aubrieta deltoidea	Satureia alpina
Dianthus (all species)	Sedum (all species)
Dryas (all species)	Teucrium (all species)
Erodium (all species)	Thymus (all species)
Gypsophila repens	Veronica (all species)
Helianthemum (many species)	Viola cornuta —gracilis

K.—RAISED BY DIVISION

Many rock plants may be pulled apart in summer, and each piece, if carefully set out and watered, will soon be as large as the parent plant.

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Even if seed or cuttings are possible methods, this gives the largest plants quickest and with less trouble for the beginner.

Achillea (all species)	*Iris cristata, etc.
Androsace (all species)	Myosotis (perennial species)
Antennaria (all species)	*Pentstemon (many species)
Arabis (many species)	Arenaria (all species)
Aubrieta deltoidea	*Phlox (all species)
Campanula (many species)	Potentilla (many species)
*Chrysanthemum arcticum	Saxifraga (many species)
Draba (many species)	Sedum (all species)
Epilobium nummularifolium, etc.	Sempervivum (all species)
Epimedium (all species)	Stellaria (all species)
*Heuchera (all species)	Thymus (all species)
	Veronica (all species)

BIG GROUPS FOR EXPERIMENT

By this time in the development of your rock garden you are ready to try anything. The big groups of many rock species, from which you may try endless sorts, are here listed, though not all their species are rock plants: Anemone, Dianthus, Gentiana, *Pentstemon, *Phlox, Primula, Saxifraga, Sedum, Silene, and Veronica.

The greater part of the rock plants offered by

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dealers as seeds or plants are from the mountains of Europe, Alps, Pyrenees, Balkans, Urals, Caucasus, or the hills of Britain and Scandinavia. Little plants from the isles of the Mediterranean or the cliffs of North Africa are often doubtfully hardy in New England, but of easy culture farther south. From Japan, and China in her many provinces, and from Siberia, many useful rock plants have come in recent years (as *Primula* and *Gentiana*), and many more will come through enthusiastic collectors. Many new herbs from New Zealand seem to be at home in English rock gardens, and some of them endure the winters of Boston. From the Andes and Patagonia a few very hardy alpines are already in cultivation, but little is known of what may be in store.

For American rock gardens, since all these plants can be imported only as seed, our own flora is more useful than that of the Alps or Yunnan. For alpines for extreme winters there are endless plants from our own peaks and the barrens from Labrador to Alaska. For rock plants of easy culture there are the small wild flowers of the hills and fields of every section. Nearly all of them are of easiest culture. Too few are as yet available. For rock gardens of little winter and long dry summers, there are tiny

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perennials unknown and unnoted, except by botanists, in our southern Alleghenies and the untrodden steeps and wastes of the great Southwest. The more common sorts already purchaseable are marked * in the lists, but this is but a fraction of those worthy. To the usual values of a rock garden, we may add plant hunting and testing right at home.

VII

ROCK SHRUBS

ENTHUSIASTS in rock gardens are always eloquent over tiny little perennial herbs of no stature at all. Yet many little rock plants are truly shrubs. Why not use more shrubs in a rock garden? Why not even build a rock garden wholly of shrubs? Such a planting would have its interest throughout the year; but nothing like this has been attempted.

The characteristics of shrubs well suited for the rock garden are not well understood. The height should be not over one or two feet, to be in scale with the details of the construction and the herbaceous planting, save at certain points a shrub of larger stature is used as accent or to mark transition to another section of the scene. But such plants as Irish Juniper and *Magnolia stellata* are too suggestive of the formal garden or well-trimmed lawn, and have no relation to alpine peaks.

Their root systems should go deeply into the bank, that dry seasons or pulling frost may not

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harm them. Pretty little Daphne has not much root and is rather useless, as some extreme of climate is sure to take most of the life out of it frequently.

Of course, some special beauty of flower, fruit, or foliage is expected, but most important for a rock garden is depressed or irregular shape suggesting the force of the winds upon the branches, and barren soil stunting the growth. Any shrub which grows freely should be excluded. Horticultural forms of dwarfed and stunted nature may be used, partly because they are uncommon and of unusual shape, but more because they reflect the restraining powers of nature.



FIG. 7.—SHRUB AND ROCK

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But most shrubs in a rock garden get too large and crowd out the perennial plants. There is a scarcity of small shrubs; yet there are sufficient in cultivation to make a good showing.

The following are, as a rule, perfectly hardy in the winters of Boston in conditions of a well-built rock garden. For a warmer climate this list would be much longer.

A.—EVERGREEN SHRUBS

In addition to the list of evergreen perennials (Chapter VI) already given, we may include other true shrubs with foliage on duty all the year. The flower effect of these is not striking as a rule, except Erica, Calluna, Daphne, *Pentstemon, and Rhododendron.

**Arctostaphylos alpina*, Alpine Bearberry

—**uva-ursi*, Bearberry

Berberis gagnepainii, Black Barberry

—*verruculosa*, Warty Barberry

—*wilsonae*, Wilson Barberry

Buxus microphylla, Littleleaf Box

Calluna vulgaris, Heather

**Cassiope hypnoides*, Moss-plant

—**tetragona*, Four-angle Cassiope

Cotoneaster adpressa, Creeping Cotoneaster

—*horizontalis*, Rock Cotoneaster

—*microphylla*, Rockspray, etc.

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- Daboecia cantabrica, Irish Heath
Daphne cneorum, Rose Daphne
*Diapensia lapponica, Diapensia
Erica carnea, Spring Heath
Euonymus radicans minima, Baby Wintercreeper
*Gaylussacia brachycera, Box Huckleberry
—*dumosa, Dwarf Huckleberry
Helianthemum hirsutum, Hairy Sunrose
—nummularium, Common Sunrose
Hyssopus officinalis, Hyssop
Lavandula vera, True Lavender
*Leiophyllum buxifolium, Sandmyrtle
Lonicera nitida, Shining Honeysuckle
—pileata, Privet Honeysuckle
*Mahonia repens, Creeping Hollygrape
Micromeria croatica, Croatian Savory
*Pachistima canbyi, Canby Pachistima
*Phyllodoce caerulea, Mountain-heath
—*empetriformis, Crowberry Mountain-heath
—*breweri, Brewer Mountain-heath
Rhododendron ferrugineum, Rock Rhododendron
—hirsutum, Garland Rhododendron
Rhodothamnus chamaecistus, Thyme-leaf Rhododendron
Santolina chamaecyparissus, Lavender-cotton
Thymus vulgaris, Common Thyme
*Vaccinium macrocarpon, Cranberry
—*vitisidaea, Cowberry

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DWARF CONIFERS

- Chamaecyparis obtusa nana compacta*, Dwarf
Hinoki Cypress
Juniperus chinensis sargentii, Sargent Juniper
—**communis depressa*, Prostrate Juniper
—**horizontalis*, Creeping Juniper
—**douglasii*, Waukegan Juniper
—*sabina tamariscifolia*, Tamarix Savin
Taxus cuspidata nana, Dwarf Japanese Yew

B.—DECIDUOUS SHRUBS

Masses of flowers are expected of rock garden shrubs. Some of the small deciduous sorts give good bloom with charm of habit, fruit, or foliage at other seasons. There are far too few small shrubs in nature, and many of these have little value as rock shrubs unless the garden is of great size. For descriptions see "Manual of Cultivated Trees and Shrubs," by Alfred Rehder, or Bailey's "Standard Cyclopedia of Horticulture."

EARLY SPRING—APRIL—MAY

- Cydonia (Chaenomeles) maulei (japonica)*,
Lesser Flowering Quince
Cytisus hirsutus, Hairy Broom
—*nigricans*, Spike Broom
—*purgans*, Provence Broom

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- purpureus*, Purple Broom
- supinus*, Bigflower Broom, etc.
- Daphne alpina*, Alpine Daphne
 - altaica*, Mongolian Daphne
 - caucasica*, Caucasian Daphne
 - mezereum*, February Daphne, etc.
- Genista anglica*, Alpine Broom
 - germanica*, German Broom
 - hispanica*, Spanish Broom
 - pilosa*, Silkyleaf Broom
 - sagittalis*, Arrow Broom, etc.
- Salix incana*, Rosemary Willow
 - tristis*, Dwarf Pussy Willow
- **Vaccinium pensylvanicum*, Lowbush Blueberry
 - **caespitosum*, Dwarf Bilberry

EARLY SUMMER—JUNE—JULY

- Coronilla minima*, Small Crown-vetch
- **Fendlera rupicola*, Fendlera
- **Hudsonia ericoides*, Heath Hudsonia
 - **tomentosa*, Woolly Hudsonia
- **Hypericum buckleyi*, Mountain St. Johnswort
 - **galionoides*, Bedstraw St. Johnswort, etc.
- Lonicera saccata*, Swollen Honeysuckle
 - spinosa*, Thorn Honeysuckle
 - tangutica*, Blush Honeysuckle
 - thibetica*, Tibetan Honeysuckle, etc.
- **Philadelphus microphyllus*, Littleleaf Mock-orange

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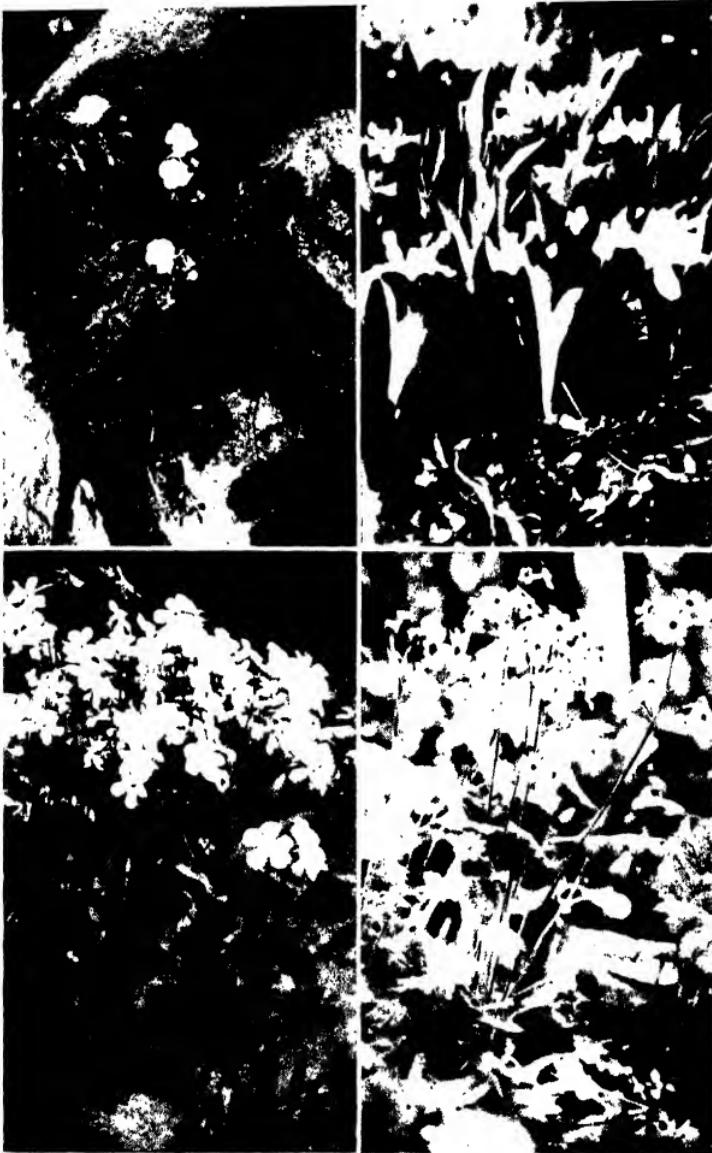
- **Rosa humilis* (*carolina*), Pasture Rose
 - spinosissima*, Scotch Rose
 - **stellata*, New Mexico Rose, etc.
- **Rubus hispida*, Swamp Dewberry
- Spiraea alpina*, Alpine Spirea
 - cana*, Downy Spirea
 - crenata*, Snow Spirea, etc.

VIII

ALP, MORAINE, AND WALL

THE term alpine is usually employed interchangeably for rock plant and frequently the plants are the same, but rock plants grow at any elevation among rocks (or in sand), while alpines are on mountain tops above the timber line and up to perpetual ice. They were first labeled on the Alps of Europe, but now from any mountain peak on any continent. They are minute plants, usually tufted, and cannot compete with the vigor of plants of larger growth. True alpines would thus be far more difficult to grow in garden soils and at sea levels, and for the average rock garden where most of us live, it may be avoiding disappointment to omit them. Yet after *Arabis*, *Iberis*, and **Phlox* have overrun the rock garden, we feel like tempting fate and attempting alpines.

All the craft in construction of a rock garden will now be needed, and more so. The soil areas must be narrow and perfectly drained below and on the surface. Gravel and rock chips may be inserted freely in the soil mixture, and a rooting



Top left.—Syrian Heronbill, *Erodium amanum*. *Top right.*—Crested Iris, **Iris cristata*. *Bottom left.*—Blue Phlox, **Phlox divaricata*. *Bottom right.*—Bigleaf Primrose, *Primula cortu-*
oides

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night dew for the greatest number of hours. Alpines must have full skylight and free air circulation, not in shade of trees or buildings; yet rarely should they feel the full force of midday sun. Thus, the greatest possible use must be made of the low angle of slope to the north, with plenty of upstanding rocks to cut the rays of the sun. A bank facing directly to the north is ideal as an alpine possibility, but best of all is a deep cut like the sides of a sunken drive running somewhat east-west, with a cool breeze drawing through from woodland or lake. Such natural ravines are frequently found and they may be constructed at some expense. If alpines can be kept out of baking sun and in a cool air, most of them may be coaxed to live. This is especially true of all the smaller Saxifrages.

One more detail, the most essential, is surface drainage close about the crown. An alpine is impatient of wetness among the foliage and should have a pack of stone chips holding the crown from the soil below. It seems foolish to feed the plants every year with chips of rock the size of grains of corn, but this does the trick, and winterkilling and frost-heaving are unknown when the chip blanket is present. As for winter protection, the north slope and chip blanket will take care of the mild winters, and in the cold winters

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with plenty of snow, the alpines begin to be interested in their new home.

ALPINES

- Acaena glabra*, Smooth Acaena
—*myriophylla*, Yarrow Acaena
Acantholimon glumaceum, Comb Prickly-thrift
Acanthophyllum spinosum, Bush Spinepink
Achillea clavennae, Silver Alpine Yarrow
Aethionema (many species), Stonecress
Alyssum idaeum, Greek Alyssum
Androsace chamaejasme, Dwarf Rock-jasmine
—*lanuginosa*, Woolly Rock-jasmine
**Antennaria rosea*, Pink Pussytoes
**Arenaria formosa*, Showy Sandwort
—**laricifolia*, Larchleaf Sandwort
Asperula cynanchica, Quinsywort
—*gussonii*, Sicilian Woodruff
—*suberosa*, Athoa Woodruff
Campanula caespitosa, Dwarf Harebell
—*cenisia*, Cenis Bellflower
—*fragilis*, Fragile Bellflower
—*garganica*, Gargano Bellflower
—*petraea*, Cliff Bellflower
—*portenschlagiana* (*muralis*), Dalmatian Bellflower
—*raineri*, Rainer Bellflower
—*saxifraga*, Saxifrage Bellflower

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- scheuchzeri*, Threadleaf Bellflower
- zoysii*, Zoy Bellflower, etc.
- Codonopsis clematidea*, Clematis Littlebell
 - ovata*, Larger Littlebell
 - tangshen*, Tangshen Littlebell, etc.
- Cyclamen coum*, Coum Cyclamen
 - europaeum*, European Cyclamen
- Dianthus alpinus*, Alpine Pink
 - callizonus*, Ringed Pink
 - glacialis*, Ice Pink
 - graniticus*, Granite Pink
 - petraeus*, Ledge Pink
 - pungens*, Prickly Pink, etc.
- Draba aizoon*, Aizoon Whitlowgrass
 - **alpina*, Alpine Whitlowgrass
 - **nivalis*, Snow Whitlowgrass, etc.
- **Epilobium alpinum*, Alpine Willow-weed
 - **anagallidifolium*, Pimpernel Willow-weed
 - nummularifolium*, Moneywort Willow-weed
- **Erigeron caespitosus*, Dwarf Fleabane
 - **compositus*, Cutleaf Fleabane
 - **simplex*, Arctic Fleabane, etc.
- Erinus alpinus*, Alpine Liver-balsam
- Erodium macradenum*, Fragrant Heronbill
- Gentiana bavarica*, Bavarian Gentian
 - verna*, Spring Gentian, etc.
- Globularia cordifolia*, Heartleaf Globedaisy
 - trichosantha*, Syrian Globedaisy
- Hutchinsia alpina*, Alpencress

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- Leontopodium alpinum*, Common Edelweiss**
 - sibiricum*, Siberian Edelweiss
- ****Lewisia oppositifolia*, Twinleaf Bitter-root**
 - **pygmaea*, Least Bitter-root
 - **rediviva*, Bitter-root, etc.
- ****Lesquerella alpina*, Alpine Bladderpod**
- Linaria alpina*, Alpine Toadflax**
- Lychnis alpina*, Arctic Campion**
 - lagascae* (*Petrocoptis lagascae*), Lagasca Catchfly
 - pyrenaica* (*Petrocoptis pyrenaica*), Pyrenees Catchfly
- Papaver alpinum*, Alpine Poppy**
 - pyrenaicum*, Pyrenees Poppy
- ****Pentstemon caespitosus*, Creeping Pentstemon**
 - **rattani minor*, Pygmy Pentstemon, etc.
- Pelargonium endlicherianum*, Alpine Geranium**
- ****Phlox adsurgens*, Bending Phlox**
 - **bryoides*, Pale Blue Alpine Phlox
 - **caespitosa*, Alpine Phlox
 - **canescens*, Hoary Phlox
 - **condensata*, Tufted Phlox
 - **douglasii*, Douglas Phlox
 - **grayi*, Navaho Phlox
 - **mesoleuca*, Mesa Phlox
 - **nana*, Pygmy Phlox, etc.
- Phyteuma comosum*, Thread Rampion**
 - globulariaefolium*, Globedaisy Rampion
 - scheuchzeri*, Horned Rampion

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- serratum*, Toothed Rampion
- sieberi*, Sieber Rampion, etc.
- Primula frondosa*, Balkan Primrose
 - minima*, Pygmy Primrose
 - nivalis*, Snow Primrose
 - olgae*, Olga Primrose
 - **parryi*, Parry Primrose
 - saxatilis*, Rock Primrose
 - viscosa*, Clammy Primrose, etc., etc.
- Saxifraga aizoon*, Aizoon Saxifrage
 - **austromontana*, Cascade Saxifrage
 - **bronchialis*, Alaska Saxifrage
 - burseriana*, Burser Saxifrage
 - caesia*, Grey Saxifrage
 - decipiens*, Cushion Saxifrage
 - lingulata*, Tongue Saxifrage
 - longifolia*, Longleaf Saxifrage
 - marginata*, Dotted Saxifrage
 - muscodoides*, Musk Saxifrage
 - **rhomboidea*, Diamond Saxifrage, etc., etc.
- Sedum brevifolium*, Shortleaf Stonecrop
 - dasyphyllum*, Leafy Stonecrop
 - **divergens*, Forked Stonecrop
 - **douglasii*, Douglas Stonecrop
 - hispanicum minus*, Mealyamat
 - **obtusatum*, Bluntleaf Stonecrop, etc.
- Sempervivum* (most species), Houseleek
- **Sibbaldia procumbens*, Creeping Sibbaldia
- **Silene acaulis*, Moss Campion
 - alpestris*, Alpine Catchfly

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As a large part of moraine plants will grow in no other place, if you wish to grow them start special construction. If the water supply does not fail, these plants will thrive through summer heat and drought at the low elevations of our homes.

MORAINE PLANTS

- Androsace alpina*, Alpine Rock-jasmine
 - carnea*, Pink Rock-jasmine
 - pyrenaica*, Pyrenees Rock-jasmine
 - villosa*, Hairy Rock-jasmine
- **Arenaria arctica*, Arctic Sandwort
 - **ciliata*, Fringed Sandwort
- **Arnica mollis*, Hairy Arnica
- **Braya humilis*, Low Rockcress
- Campanula cenisia*, Cenis Bellflower
- Draba aizoides*, Stonecrop Whitlowgrass
 - **alpina*, Alpine Whitlowgrass
 - **incana*, Hoary Whitlowgrass, etc.
- **Epilobium latifolium*, Wideleaf Willow-weed
- Eritrichium nanum*, Alpine Forget-me-not
- Erodium chamaedryoides*, Reichard Heronbill
 - trichomanefolium*, Maidenhair Heronbill
- Gentiana alpina*, Alpine Gentian
 - farreri*, Farrer Gentian
 - gelida*, Icecold Gentian
 - **glauca*, Glacier Gentian
 - ornata*, Showy Gentian
 - **parryi*, Parry Gentian

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- **prostrata*, Creeping Gentian
- septemfida*, Sevenleaved Gentian, etc.
- **Houstonia serpyllifolia*, Creeping Bluets
- Linaria hepaticaefolia*, Liverleaf Toadflax
- Mentha requienii*, Requier Mint
- **Parnassia asarifolia*, Brook Parnassia
 - **caroliniana*, Carolina Parnassia
 - **fimbriata*, Rocky Mountain Parnassia
 - **palustris*, Marsh Parnassia
- Primula beesiana*, Bees Primrose
 - bulleyana*, Bulley Primrose
 - capitata*, Clustered Primrose
 - darialica*, Pygmy Primrose
 - **farinosa*, Birdseye Primrose
 - involucrata*, Leafy Primrose
 - luteola*, Golden Primrose
 - **mistassinica*, Dwarf Canadian Primrose
 - sibirica*, Siberian Primrose
 - **suffruticosa*, Sierra Primrose
 - veitchii*, Veitch Primrose
 - viscosa*, Clammy Primrose, etc.
- Ramondia pyrenaica*, Rosette Mullein
- **Saxifraga aizoides*, Yellow Mountain Saxifrage
 - aphylla*, Leafless Saxifrage
 - conifera*, Matted Saxifrage
 - diapensioides*, Diapensia Saxifrage
 - granulata*, White Saxifrage
 - hypnoides*, Moss Saxifrage, etc.
- Scutellaria alpina*, Alpine Skullcap

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- **Sedum pulchellum*, Texas Stonecrop
 - ternatum*, Mountain Stonecrop
- **Silene acaulis exscapa*, Stemless Moss Campion
- Stachys corsica*, Corsican Betony
- Viola cenisia*, Cenis Violet
 - **glabella*, Cascade Violet

Another special alpine garden appears in walls. So many are the sites where rock plants may be placed that broken walls were tried and found good for the growth of the plants and excellent in



FIG. 8.—WALL PLANTING, PLAN AND SECTION

effect. In regions where there is much moisture in the atmosphere in the summer, as the British Isles or the coast of Maine, or where a moist

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breeze draws through a shaded ravine or across a slope facing north, it is possible to grow many rock plants in an old wall, or a new one constructed for that purpose. But to knock a brick out of a solid wall on the south side and toss in a little soil of any kind and jam in a rock plant, is usually a waste of time and plant.

Retaining walls at a 45° slope, unless fully exposed to the sun all day, are merely formal rock gardens, but such walls may be nearly perpendicular, say set back one foot horizontal for each ten feet vertical; and if the stones are backtilted downward so that the soil and moisture will be retained, any of the tougher rock plants and many of the alpines will grow. But if the soil veins are horizontal or slope upward from the wall face, or if the soil and plants are pushed in after the wall has been built, both plants and soil will become as dry as dust, and soon fall out. Even in free-standing stone walls that are built with wide base and heavy stones well interlocked (no cement used), the soil put in as the wall is built, with no air pockets and direct connection to the earth below, many rock plants will thrive amazingly.

Usually the tufted and drooping plants are best for walls, and they must be set sufficiently far apart that they do not crowd out one an-

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other. These should be mostly evergreen woody perennials, as Iberis and Alyssum; and the small shrubs, as Cotoneaster and Genista, are particularly effective when placed in rock walls.

IX

WOODLAND AND WATER

ALL the rock plantings so far described have been open to full light of the sky, though not to full power of the sun all day. Many a site is in full or partial shade from buildings or tall trees. Such is not a proper place for a rock garden, for this is merely a shaded wildgarden with rocks added for appearance. No special skill is needed in placing the rocks, for these are not necessary to the growth of the plants, as the shade helps to keep an even temperature and an unvarying moisture in air and soil.

If the natural soil is clay or pure sand, or very hard, it should be removed to a depth of at least a foot, and the usual rock garden soil recipe used, with extra measure of vegetable fibre and leafmold. We are imitating conditions in rocky woods where Maidenhair Fern or Hepatica is found, and merely compressing in a small compass the flowers of many leagues of woods. As summer rain may not be plentiful and the poor plants become quite dry in this manufactured dale, it will be well to soak thoroughly with the

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hose twice a month in July and August. This and necessary weeding are all the after-care, and compared to a high power rock garden this is childishly easy to make and to operate.

The great difference is in the plants used. In the main, an entirely new list of plants must be procured. Lovers of sun or alkali will never thrive, and we bring our treasures from the woodland flora. Many are the native American plants suited for this treatment, and dealers in wild flowers usually indicate those that are shade-preferring. Any hardy fern, not over a foot in stature (unless this area is very large), will grow wonderfully well here, even too well in case of Hayscented and Lady Ferns. The flowers will be mostly of the spring season, but foliage will be luxuriant throughout the summer.

Very pleasant it is as contrast and variety to have this woodland garden adjoin the true rock garden, and a new plant which dies in one area may thrive in the other. Or this planting may be built anywhere in the woods where rocks can be placed under trees, and nature will take a large part of the burden of the after-care. There is no winter protection, for frost heaving is impossible. This is, then, the simplest kind of rock planting, but the difficulty comes in making special choice of the plants.

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Many of these woodland plants may be dug from the woods of our northern states, but it is cheaper and easier as a rule to buy from dealers in native plants. From our southern forests or the Rockies the list would be quite different.

WOODLAND ROCK GARDEN PLANTS

- Anemone apennina, Apennine Anemone
 - blanda, Greek Anemone
 - nemorosa, European Wood Anemone
 - *quinquefolia, American Wood Anemone
 - ranunculoides, Buttercup Anemone, etc.
- *Anemonella thalictroides, Rue Anemone
- *Asarum canadense, Canadian Wildginger
 - *caudatum, Longtail Wildginger
 - europaeum, European Wildginger, etc.
- *Asclepias quadrifolia, Fourleaf Milkweed
- Asperula odorata, Sweet Woodruff
- *Chimaphila maculata, Striped Pipsissewa
 - *umbellata, Common Pipsissewa
- Cimicifuga japonica, Japanese Bugbane
 - simplex, Kamchatka Bugbane
- *Claytonia caroliniana, Carolina Springbeauty
 - *virginica, Springbeauty
- *Cornus canadensis, Bunchberry
- *Cypripedium californicum, California Lady-slipper
 - *candidum, White Ladyslipper
 - *montanum, Mountain Ladyslipper

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- **Dalibarda repens*, Dalibarda
- **Dicentra canadensis*, Squirrelcorn
 - **cucullaria*, Dutchmans-breeches
 - **formosa*, Western Bleedingheart
- **Epigaea repens*, Trailing-arbutus
- Epimedium* (many sorts), Epimedium
- **Erythronium* (many species), Troutlily
 - dens-canis*, Dogtooth Troutlily
- Galanthus nivalis*, Common Snowdrop
- **Galax aphylla*, Galax
- **Gaultheria procumbens*, Wintergreen
- **Hepatica acutiloba*, Sharplobe Hepatica
 - **triloba*, Roundlobe Hepatica
- **Jeffersonia diphylla*, Twinleaf
- **Linnaea americana*, American Twinflower
- **Lygodium palmatum*, Hartford Fern
- **Mitchella repens*, Parridgeberry
- **Moneses uniflora*, Oneflower Wintergreen
- **Oakesia sessilifolia*, Little Merrybells
- Ophiopogon jaburan*, Jaburan
 - japonicus*, Japanese Snakebeard
- **Oxalis acetosella*, Common Woodsorrel
 - **oregana*, Oregon Woodsorrel
 - **violacea*, Violet Woodsorrel
- **Polygala pauciflora*, Fringed Polygala
- Primula acaulis*, English Primrose
 - auricula*, Auricula
 - veris*, Cowslip Primrose, etc.
- **Pyrola elliptica*, Shinleaf
- **Sanguinaria canadensis*, Bloodroot

Schafta Catchfly, *Silene schafftii*

PLATE X.—ROCK HERBS OF FIG. 11



West Corner and Walk



East Corner and Steps



PLATE XI.—VIEWS OF ROCK GARDEN OF FIG. 11, FIRST YEAR AFTER PLANTING.

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- Scilla bifolia, Twinleaf Squill
 - sibirica, Siberian Squill
- *Shortia galacifolia, Oconee-bells
- *Thalictrum dioicum, Early Meadowrue
- *Trientalis americana, American Starflower
- *Trillium nivale, Dwarf Trillium
 - *rivale, Brook Trillium, etc.
- *Vancouveria hexandra, American Barrenwort
- *Viola palmata, Palm Violet
 - *pedata, Birdsfoot Violet
 - *pubescens, Downy Yellow Violet
 - *rotundifolia, Roundleaf Violet, etc.

FERNS FOR WOODLAND ROCK GARDENS

Any except the largest ferns may be planted in woodland near rocks.

- *Adiantum capillus-veneris, Southern Maidenhair Fern
 - *pedatum, American Maidenhair Fern
- *Asplenium pinnatifidum, Pinnatifid Spleenwort
 - *platyneuron, Ebony Spleenwort
 - *trichomanes, Maidenhair Spleenwort
 - *viride, Green Spleenwort
- *Blechnum spicant, Deer Fern
- *Camptosorus rhizophyllus, Walking Fern
- *Cheilanthes lanosa, Hairy Lipfern
- *Cystopteris bulbifera, Berry Bladderfern
 - *fragilis, Brittle Bladderfern
- *Lycopodium lucidulum, Shining Clubmoss

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- **Lygodium palmatum*, Hartford Fern
- **Phegopteris polypodioides*, Narrow Beechfern
- **Phyllitis scolopendrium*, Hartstongue
- **Polypodium polypodioides*, Resurrection Fern
- **vulgare*, Common Polypody

So far in our rock gardens every area has been dry, or watered but little. We build especially to conserve all moisture possible, and true rock plants will not tolerate continuous dampness about their roots. Yet in any mountain meadow there are little hollows where moisture is permanent, and here many lovely flowers grow. For little bogs no care need be taken in the placing of the rocks, for the stones are merely ornamental and serve only as dividing fences between. The real problem is in holding constant moisture. This means an impervious layer of clay (or even concrete) a foot or more below surface and a dam cleverly built on the lower side, to hold a certain water level and yet allow a flow to the water. The soil should be mostly peat or other vegetable fibre, and only acid-loving plants can be used, unless the water supply is alkaline.

As with the woodland planting, an entirely different list must be used; and those plants which refuse in any other placing (as Asiatic Primulas) may grow very easily here. If the water supply is constant, and the right plants are used, these

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little bogs and marshes are wonderful as flower holders in the scene, requiring very little care.



FIG. 9.—ALPINE WATERFALL

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In the dryest weather the foliage will be fresh and green, deaths will be few, and winter will not harm them. The extreme ease of operation of this kind of rock planting is offset by the bill for the water used, unless a natural water source (better also for the growth of the plants than water from city wells) can be pressed into service.

WET-SOIL ROCK PLANTS

- **Arethusa bulbosa*, Arethusa
- **Arnica mollis*, Hairy Arnica
- Astilbe simplicifolia*, Star Astilbe
- **Botrychium obliquum*, Ternate Grape-fern
 - **virginianum*, Rattlesnake Fern
- **Calla palustris*, Wild Calla
- **Calopogon pulchellus*, Grass-pink Orchid
- **Caltha leptosepala*, White Marshmarigold
- **Calypso bulbosa* (*Calypso borealis*), Calypso
- **Chiogenes hispidula*, Creeping Snowberry
- **Coptis trifolia*, Goldthread
- **Cypripedium candidum*, White Ladyslipper
- **Dodecatheon clevelandii*, Cleveland Shooting-star
 - **radicatum*, Southern Shootingstar
- **Drosera filifolia*, Narrow Sundew
- **Gentiana crinita*, Fringed Gentian
 - **linearis*, Narrowleaf Gentian
- Geranium phaeum*, Mourning-widow Cranesbill
 - sanguineum*, Bloodred Cranesbill

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- **Goodyera pubescens*, Downy Rattle-snake Plantain
- **Houstonia caerulea*, Bluets
- **Jeffersonia diphylla*, Twinleaf
- **Mimulus lewisii*, Lewis Monkeyflower
- **Mitella diphylla*, Common Bishopscap
- Myosotis palustris*, True Forget-me-not
- **Ophioglossum vulgatum*, Common Adderstongue
- **Orchis spectabilis*, Showy Orchid
- **Orontium aquaticum*, Goldenclub
- **Parnassia caroliniana*, Carolina Parnassia
 - **palustris*, Marsh Parnassia
- **Pogonia ophioglossoides*, Rose Pogonia
- Primula algida*, Violet Primrose
 - denticulata*, Himalayan Primrose
 - cashmeriana*, Kashmir Primrose
 - grandis*, Giant Primrose
 - helodoxa*, Marsh Primrose
 - japonica*, Japanese Primrose
 - luteola*, Golden Primrose
 - rosea*, Rosy Primrose
 - sieboldii*, Siebold Primrose, etc.
- **Rhexia virginica*, Common Meadowbeauty
- **Saxifraga mertensiana*, Cascade Saxifrage
 - **nivalis*, Snow Saxifrage
 - **rivularis*, Alpine Brook Saxifrage, etc.
- **Sisyrinchium angustifolium*, Common Blue-eyed-grass
- **Thalictrum alpinum*, Arctic Meadowrue
 - minus*, Low Meadowrue

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- **Tiarella cordifolia*, Allegheny Foamflower
- **Trichomanes boschianum*, Filmy-fern
- Trollius chinensis*, Chinese Globeflower
 - **laxus albiflorus*, White Globeflower
- **Typha angustifolia*, Narrowleaf Cattail
- **Viola blanda*, Sweet White Violet
 - **lanceolata*, Lanceleaf Violet
 - **primulaefolia*, Primrose-leaf Violet, etc.



FIG. 10.—ALPINE POOL

X

FATALITIES

THE most disturbing factor in caring for a rock garden is the quick and complete death of many choice plants. In no other garden are the fatalities so great. Of the many hazards in operating a rock garden, the uncertain life of the plants adds the greatest variety as well as sadness of heart. No matter how careful the construction or faithful the care, there are always the absent who will nevermore return. At times it is not possible to diagnose the immediate cause of death, but the emptiness of pockets is most visible in the spring. Often winters are not the only tests, for hot, dry summers or very wet ones bring also a long list of plants gone back to their native happy country. Cultural data is given us in books, and we gain by experience, but the happiness of each plant is largely from local factors. What I learn by sad experience in my rock garden may not come to another garden, and conditions vary with every region.

The weedy unbeautiful kinds live long and in-

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crease. So dubious have I become of the virtue of new alpines that when I see one growing well and not yet in bloom, it gets catalogued as a weedy plant of little beauty of flower or foliage. Often it is not a case of handsome is as handsome does. It is too true that the less desired do flourish most amazingly. The most beloved Primulas are most difficult to grow.

There are many causes of the death of rock plants. Some, lauded by M. Correvon, at Geneva, or hardy in Oregon, will not survive the cold of New England, unless well covered with snow, and often not then. For every section of our country, there is a list of plants not hardy, but no one has made such lists. What is hardy one year may be fleeting the next. At Boston I begin this list of "too-tender-to-live" with Shrubby Gromwell (*Lithospermum fruticosum*), usually called "Heavenly Blue." By no magic can it be made to survive a New England winter. Plants of like vigor are hopeless for this climate, whatever the dealers' catalogues may say.

Abundant summer rain, unless drainage has been fully provided, will kill off alpines in quantity. Heavy growth is encouraged, and then quick decay begins in the crown of the plant. Any fertilizer at all, save a meagre diet of bone-meal, makes for too much growth. Sand- and

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gravel-packs about their necks, steep declivities of rock face to shed all rain, a poor soil to retard growth,—these are preventive measures against the germs of decay. Try growing some of the mossy Saxifrages without these precautions and see how quickly a rock plant can die.

Often the natural soil is wet, heavy, mostly of clay. Well, half your rock plants will die quickly and quietly in that soil, and only the tough kinds can survive. A clay soil is sure death to most rock plants. It is necessary to make over the clay soil, and for the common rock plants, even, the sand-peat-loam mixture must be used. Go over instructions in Chapter II and see if the soil preparation was properly done.

The third cause is too dry a soil through the long summers. This is a condition much to be faced in rock gardens in our southern states, though dry summers hit everywhere. Cacti and Sedums can always be rushed in to save the day, but proper construction of the rock garden is the secret of the pleasing of deep-rooting alpines. Faulty construction is the cause of dryness.

Many plants require fullest sun; others grow best in partial shade. Unless a rock plant is well understood in its local needs, it is advisable to plant your supply in two or three different

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parts of the rock garden and see which situation seems to suit better. **Sedum acre* will soon die out if the soil is a bit wet or sunless, while **Sedum ternatum* insists on a spot quite damp and shaded. Make your own notes from experiment and use best judgment, yet be certain that you will not always guess rightly.

Not a few, but many, of our rock plants are biennial, or monocarpic, meaning that no matter how robust the herb, when it has bloomed it sets seed and must then die. Many Saxifrages and Primulas are doomed to die after blooming—there is no way to save them except through seed. Alpine Poppy, Meconopsis, Campanula, Sedum, Sempervivum, Androsace, etc.,—all have short-lived species which must die after blooming, acting like annuals, though the rosette of foliage may live several years before bloom and death. To many a beautiful alpine I say, "You are beautiful, but monocarpic." No list of the monocarpic species has ever been made.

More than in any other kind of gardening, it must never be forgotten that those plants which thrive only in acid or alkaline soil conditions (see suggestive lists G, H, in Chapter VI) cannot by any method, except combination of chemical feeding and playfulness on the part of nature, be made to grow in the unfavorable soil. Alpine

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Dianthus must have good drainage and plenty of lime, while the little hardy Orchids must have a wet acid soil. To grow the two in the same pocket is beyond the power of any miracle worker, yet the enthusiast will try cheerfully at such feats.

Some alpines, long-lived in their own home, dyspeptic and over-stimulated by rich food and low altitudes, give a life-time of bloom in a season or two and expire. This is a frequent eventuality. It happens right along with Dianthus, Draba, and Viola, and related kinds of Pink, Mustard, and other families. Keep them starved and as dry as possible, and hope for the best.

Open winters are the most trying of all conditions. To cover or not? Well, a heavy covering is certain to finish off all rock herbs that have green, leafy, or persistent tops, unless the winter is unusually cold and dry. Plants with evergreen tops, as *Moss Phlox, are their own winter cover for the soil. The plants wholly deciduous, which die away completely to below the ground, and live and hibernate wholly below earth, as bulbs or Thalictrum, are sure to survive any winter, with or without a covering. Putting on a winter cover, other than the dried tops of the plants themselves and such leaves as blow in from the lawn, is an extra labor in plac-

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ing and removing, for which no adequate return is gained. Even for the leafy-topped plants, it is cheaper and more sporting to leave off putting on any covering. It is also natural for wild flowers to go to their winter sleep without artificial covering, but nature is cruel as well as natural; and the burning which comes to leafy rock herbs some winters makes us wonder whether art, nature, or humanitarianism is to be our main guide in winter care. At any rate, the plants which are injured by an open season are as many when well covered as when left to take their own chances. Balancing the extra labor and mussy effect of covering against the probable chances of losing these treasures if left uncovered, there seems to be no real value to putting on the blankets. For the present, the Spartan method of letting each plant run its own chances with the winter seems simplest and most consistent in theory. Every winter some plants will die, but any player will miss the ball at some time in any game.

Unlike the plants of border and lawn, those of rock gardens are little troubled by insects or diseases. In their native home they are out of range of the usual garden enemies, and perhaps the pests are not aware that these little weeds are cherished now by man. There are few dis-

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eases that trouble, if the soil conditions are right for the plants; and spraying is unknown in this garden. Such common insect pests as cutworms, wire worms, and other grubs which work beneath the soil may eat the roots, if the soil is rich and garden-like, but they won't stay long in the sandy prepared soil. Violets are chewed by the caterpillars of copper butterflies; grasshoppers, crickets, and other general foliage feeders eat some plants, but the damage is not usually great. Primroses and many alpines are wholly devoured by slugs, snails, and such small animals, even mice, which find the rocks a safe refuge. Traps and poisoned bait will get some of them, but most effective is a personal hunt in the early hours. A clever scheme to protect choice weeds is to surround a section of the rock garden with a small moat of little depth of water, without drawbridge. With care at the time of construction to keep off all animal life, the worms and slugs will be forever excluded by the ring of water.

After this long, sad tale of causes and circumstances, bringing sudden departures every year in our rock garden friends, there is much to be related about those permanent residents who stay always and flourish on, regardless of seasons and lack of special care on your part. (See List D, Chapter VI).

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These notes on the mortality of rock plants are taken particularly in the region of Boston. While conditions and seasons ever vary, some of the temporary conclusions here stated may be of comfort and assistance to lovers of rock plants in other regions.

XI

TYPICAL PLAN

It is one task to study in advance the theory of placing the rocks, and further experience waits on the actual construction. A willing student can soon grasp the essential principles—mechanical, cultural, and esthetic—to be followed in making the home for mountain plants. Another mental labor of more diverse nature is the study of the identity and habits of rock plants, for the greater quantity of these herbs makes this task far longer than for the usual garden plants. But the operation of setting the plants actually into the pockets, of planning and producing the combinations, is yet another matter. I have made more failures than successes in planting rock herbs, both from poor cultural methods and unpleasant groupings, but there is no harm in that. After several failures in a soil pocket, there may come a pleasing planting which will endure and be a joy for years, for one success balances several failures.

In staging the plants on plan for this kind of

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garden, the considerations are quite different from those for a formal garden or hardy border. The things to be kept in mind may be stated first as general principles and then their application to a particular plan may be shown, with the proviso that details can be completed only on the ground at the time of actual planting.

Scale is a measure to be applied in every placing, in relation of plant to size of whole area, to the nearer rocks, and the nearest plants, as to height, character of foliage, and mass of bloom. Usually the plants of more than ordinary growth and of greatest quantity would be put into the larger pockets near the more bulky rocks, with tiny plants and those of lesser quantity taking the smaller areas. There is always the danger that too much of the rock surface will be covered with vigorous foliage growth. Yet on the other hand, near many bold pieces of rock only very dwarf and slow-growing herbs should be placed, to bring out the grandeur of the ledge, to keep a variation in heights, and emphasize the irregularity of the scene. Along with the danger of covering the rocks there is also that of smothering all the details of the tiny landscape with over-vigorous vegetation.

Equally probable it is that the plants will smother one another. Much of the care of rock

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plants consists in throwing out weedy and crowding sorts and protecting the weaker ones. The robust creepers, as *Cerastium*, must be well penned in by the walls of the pocket and given plenty of room to hang down over the ledge face. Often it is best to keep the plants of the four groups—erect, tufted, creeping, and drooping—by themselves, yet for variety making this separation not too obvious, allowing some erect plants to grow among the drooping ones and bulbs among the creeping kinds. The tufted sorts prefer isolation, and these are usually on the highest spots.

For pleasure of the eye, the greatest possible variety should be sought, at the same time keeping a unified but not uniform effect. It is possible to make the planting too wild and unkempt, but more often a rock garden looks entirely too much dressed and too well tended to represent the moods of nature. There is a certain unity and plan in the arrangement of the wild flowers of the fields, and this intangible scheme should be our guide in planning the placing.

With all this striving for variety in unity, it is well to keep somewhat apart the flower masses of the same date of bloom, getting fewer of the flower combinations than is planned for a flower border. The requirements of finished pictorial

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composition are less desired here, the effect being decidedly more toward the very uneven and picturesque, with the tenets of the art of man-made pictures as little in evidence as possible. Further, each plant is to be enjoyed to a degree of itself, and it is distracting to have several adjoining pockets all in best bloom at once. Without making the arrangement spotty, it is better to stage the bloom of any week rather widely over the whole garden area, leaving each flower group set off by stones and foliage with quite a patch of one plant and then no bloom for a distance, as often is the case in nature. Yet companion crops, as tiny yellow Daffodils blooming in purple Aubrietia, are always desired and welcomed. It is hopeless to explain in words how to do it and yet not overdo each requirement.

Not only do we wish the interests of the plants well distributed over the area of the garden, but through the weeks of the year as well. Of course the climax of flower comes in the spring months; therefore, much thought must be expended to maintain interest at other times of the year. Many plants of evergreen foliage must be used (see list A in Chapters VI and VII), more than half the total planting being of this nature. Little bulbs may be added rather freely as second crop in the pockets, the bloom appearing before (or

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after) that of the major occupant of the pocket (or as companion bloom). Interest of foliage, as of Fern, *Sempervivum*, or Mossy Saxifrage; of habit, as tufted mats of **Diapensia* or irregular stems of *Cotoneaster*; or in fruits, as of **Cornus canadensis*, can always be employed to carry on the pictures when flowers are absent. A garden of this nature, when devoid of interest, indicates a poor play on the part of the planner.

Yet in the zeal of getting a wide distribution of interests both in position and time of appearance, forget not to produce striking flower effects at times and use special plants for accent and attract attention to these by their own charm and their placing. A patch of *Gentiana verna* is a magnificent solo requiring no orchestra of other spring flowers, nor do *Primula luteola*, *Cyclamen coum*, or **Viola pedata* need any helpers in presenting their message. **Iris cristata* may walk about and mingle its bloom with that of **Phlox douglasii*. Yellow Alyssum, White Iberis, Pink Arabis, and Purple Aubrieta may fall down a cliff and bloom together. In this planting, man may take a mean advantage over nature in that geographic distances can be overcome and flowers of Patagonia, Oregon, Finland, and Japan may all grow happily on one small mound. Or the geographic restriction may be used to a degree,

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and only wild flowers of one's own region be allowed, or of one major mountain range, as Caucasus, Alps, Rockies, or Andes. Soil conditions may always be made a control of plants to be used. Botany may become a major factor, and certain families or genera may dominate, as Primrose, *Pentstemon, or *Phlox; or definite flower shapes or foliage habits, as bell-like flower or grassy leafage, may be made the main motive. All kinds of intricate schemes can be thus elaborated. No other kind of gardening has such possibilities of variations.

The plan here presented indicates the working out of some of the ideas of rock construction and plant grouping, in so far as plan can demonstrate the theory. This is a corner of a garden of several sections, but shows certain characteristics found in any of them. The soil is acid or neutral. The limelovers are eliminated, as this soil is not suitable for many of the herbs of the Alps or our Western plains. It is in full sun all day long; the surface slopes to northeast.

Our present lesson is the placing of the planting in the pockets. Evergreen foliage is well distributed, yet omitting Heartleaf Saxifrage and Snow-in-Summer as too robust. The higher spots are further elevated by dwarf shrubs, which are nearly as bulky as the largest stones. Low hol-

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FIG. 11.—PLAN OF BED

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lows are kept sunken by planting only the lowest of creepers (Area A on plan). One little vale has low tufted alpines (Area B); in another, gray and silvery foliage dominate (Area C); there is a home for small plants loving moisture (Area D). No restrictions (geographic) are made, for these herbs come equally from both northern continents, yet special presentation is made of dwarf, crested, and beardless Iris, and of the better dwarf sorts of Campanula, *Pentstemon, and *Phlox. Little bulbs are freely used as companion crop in some of the pockets. Earliest and latest bloom is provided, and variety at all times of the year. It is not possible to show all the plantings, as the plan would be too crowded to be legible.

At least half the flowers are of blue color; yellow is mostly on the steep southern slope, while the reds run in an east-west line away from the yellows. Special attention is given to low creepers and tiny tufted plants in the walks.

XII

SATISFACTIONS

"I DON'T care for rock gardens," a remark by several garden club visitors.

There are too few really good examples of rock planting to be seen in our neighbors' gardens. More often the samples are quite horrible. No wonder it is difficult to get the general interest of flower-lovers in this extreme of gardening, and an enthusiast is still regarded somewhat as a freak. Yet this attitude has changed greatly since the pioneer work of William Robinson and Henri Correvon, and an understanding of the values of this type of gardening is spreading rapidly and widely. The volume of recent books and magazine articles is a good index of popularity. It is most distinct of all forms of gardening, and not easily understood. Something of the special character of the plants and their manufactured place of abode has been outlined, but to understand the appeal of a rock garden, you should build and operate one of your own. Without doubt it is the most difficult type of planting, with more chances of going wrong than in raising radishes or roses, and it requires the utmost in knowledge of plants and cultural skill.

AMERICAN ROCK GARDENS

The difficulty of construction is a challenge to try. The first section that you build will be bettered on each succeeding construction, and when one perfection is attained the next set of scenery may be varied to suit a different group of plants.

The uncertainty of continued existence of most rock plants makes a hazard in every play. No man can say, "I can grow this plant to perfection every time that I try," for the next attempt may be a total failure. Every rock plant is alive and will thrive beyond expectations for no obvious cause, or refuse to grow at all after the best of attention. The climax of ingratititude is a quick departure with no warning, after a season of best growth. When they perform best they are most temperamental.

A rock garden is a sojourn in nature, supposedly taking us out of the usual ways. It presents a souvenir of travels over mountain ranges and the flowers gathered by the path. (No one actually ever picks any flower in a rock garden—too precious.) It appeals to our love of adventure in building, in cultivating, and in walking among the treasures every day. As the bloom of each plant is usually brief, the picture must be enjoyed while it is present—and tomorrow there will be a change of cast. It has more of mystic meaning than any other form of gardening, linking the play days of man with the secrets of nature.

AMERICAN ROCK GARDENS

No one who can produce a patch of alpine gentians from a packet of seeds can be insensible to the appeal of flowers in general, but more of those unchanged by man and fresh from the hands of the Creator.

There are some of the values of Japanese gardens, in that natural scenery—of irregular nature—is produced in miniature and adorned with appropriate plants. Sentiment and symbolism may be inwoven here to a degree not allowed in gardens showing more of the craft of man. When rightly understood, they will have much greater favor. The pity is that so few sites near our homes are suited to them. Like a love for grand opera, one must train to understand this special garden as a piece of close partnership of man and nature.

There is a tremendous interest in each plant. To some enthusiasts the whole story is in cherishing each little weed to health. The more difficult of culture it is, the more seemingly admired. This is a part of the program, and a vital one, but the pleasing picture of the group of a dozen kinds of plants is more important than the vigor of but one sort. It is living presentation of flowery fields in miniature that we wish, and notes on health and culture are but a record of the means of procuring the flowers.

The labors in this field of horticulture are end-

AMERICAN ROCK GARDENS

less. There are more than 10,000 species of small perennial herbs, native to the northern hemisphere, accustomed to the action of winter frost, suitable for rock plantings, under the proper conditions for growth of each. About one half of these are as yet available. In its ultimate value, the charm of this gardening is in getting acquainted with each plant as with a new friend. You learn all about the habits of one herb and its requirements—and it acts differently in another garden. You get well acquainted with *Primula cortusoides*, and on trying *Primula helodoxa* you find an entirely new temperament, demanding wholly different tactics on your part before it will agree to abide with you. A mortal who has a group of rock plants in his charge and undertakes the task seriously and sympathetically will never lack occupation or companionship on any day of the year.



FIG. 12.—MT. WASHINGTON

APPENDIX

LIST OF COLLECTORS OF AMERICAN ROCK PLANTS

New England States:

EDWARD GILLETT, Southwick, Mass.

F. H. HORSFORD, Charlotte, Vermont

L. E. WILLIAMS, Exeter, N. H.

Central States:

MRS. GAAR G. ELIASON, Centerville, Indiana

MRS. FANNIE M. HEATH, Grand Forks, N. D.

V. D. MERRILL, Big Rock, Illinois

MISS ETHEL RUNNER, Richlieu, Kentucky

MRS. MAY STANFORD, Gould, Arkansas

"WILD FLOWERS," Maltby, Michigan

Southern Alleghenies:

HARLAN P. KELSEY, Boxford, Mass.

E. C. ROBBINS, Ashford, McDowell County,
N. C.

Rocky Mountain States:

D. M. ANDREWS, Boulder, Colorado

MRS. NEVA C. BELEW, Harmon, Okla.

ALLAN & BRIDWELL, Mountain Park, N. M.

BRIDWELL BROTHERS, Forestburg, Texas

BEN JOHNSON, 444 Center St., Salt Lake City,
Utah

MRS. ALBERT OBERGfell, Sidney, Montana

RALPH W. SHREVE, Farmington, Arkansas

D. H. SNOWBERGER, Payette, Idaho

J. B. E. WERNECKE, Royal, Nebraska

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Pacific States:

- W. I. BEECROFT, The Desert Garden, Escondido, Calif.
RALPH W. CRESSEY, Boring, Oregon
MR. McTAGGART COWAN, International Test Gardens, 2507 Jones Ave., North Vancouver, B. C.
ROBERT KESSLER, Box 1401, Los Angeles, Calif.
MRS. ADA T. KLOCKER, 28 So. Central Ave., Medford, Oregon
MRS. CLARICE NYE, Highland Park, Prospect, Jackson, County, Ore.
THEODORE PAYNE, 345 So. Main Street, Los Angeles, Calif.
CARL PURDY, Ukiah, Calif.
F. S. SKINNER, Dropmore, Manitoba, Canada
MRS. SUSAN STOKER, Cowichan Lake, B. C.

Foreign:

- REV. J. F. ANDERSON, Glenn Hall, Leicester, England
BARR & SONS, King St., Covent Garden, London, England
H. CORREVON, Jardin Floraire, Chêne-Bourg, Geneva, Switzerland
E. HALE, Wairarapa Nurseries, Masterton, New Zealand
LISSADELL NURSERIES, Sligo, Ireland
PERRY'S HARDY PLANT FARM, Enfield, England
THOMPSON & MORGAN, Ipswich, England

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